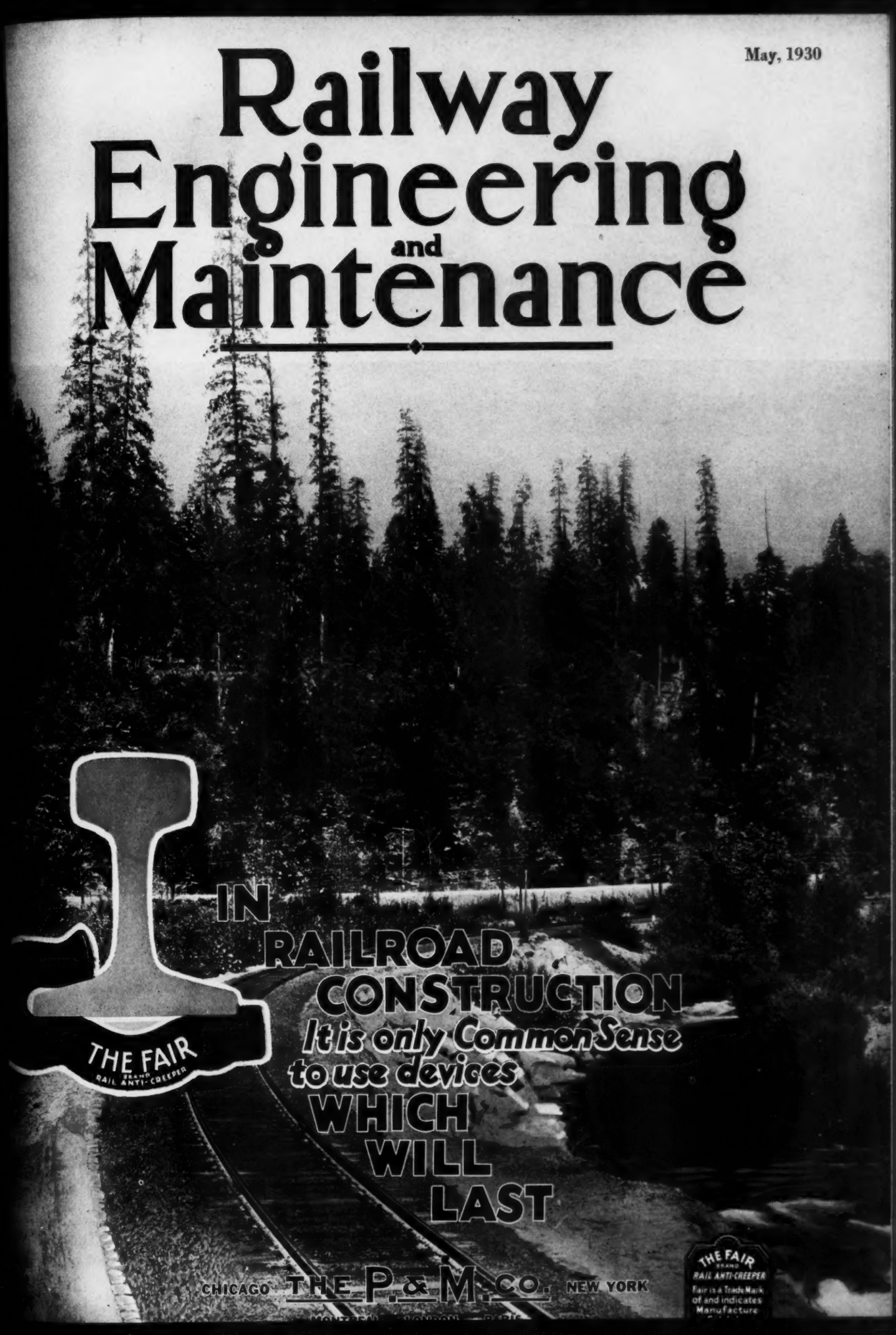
May, 1930

Railway Engineering and Maintenance



RAILWAY ENGINEERING AND MAINTENANCE
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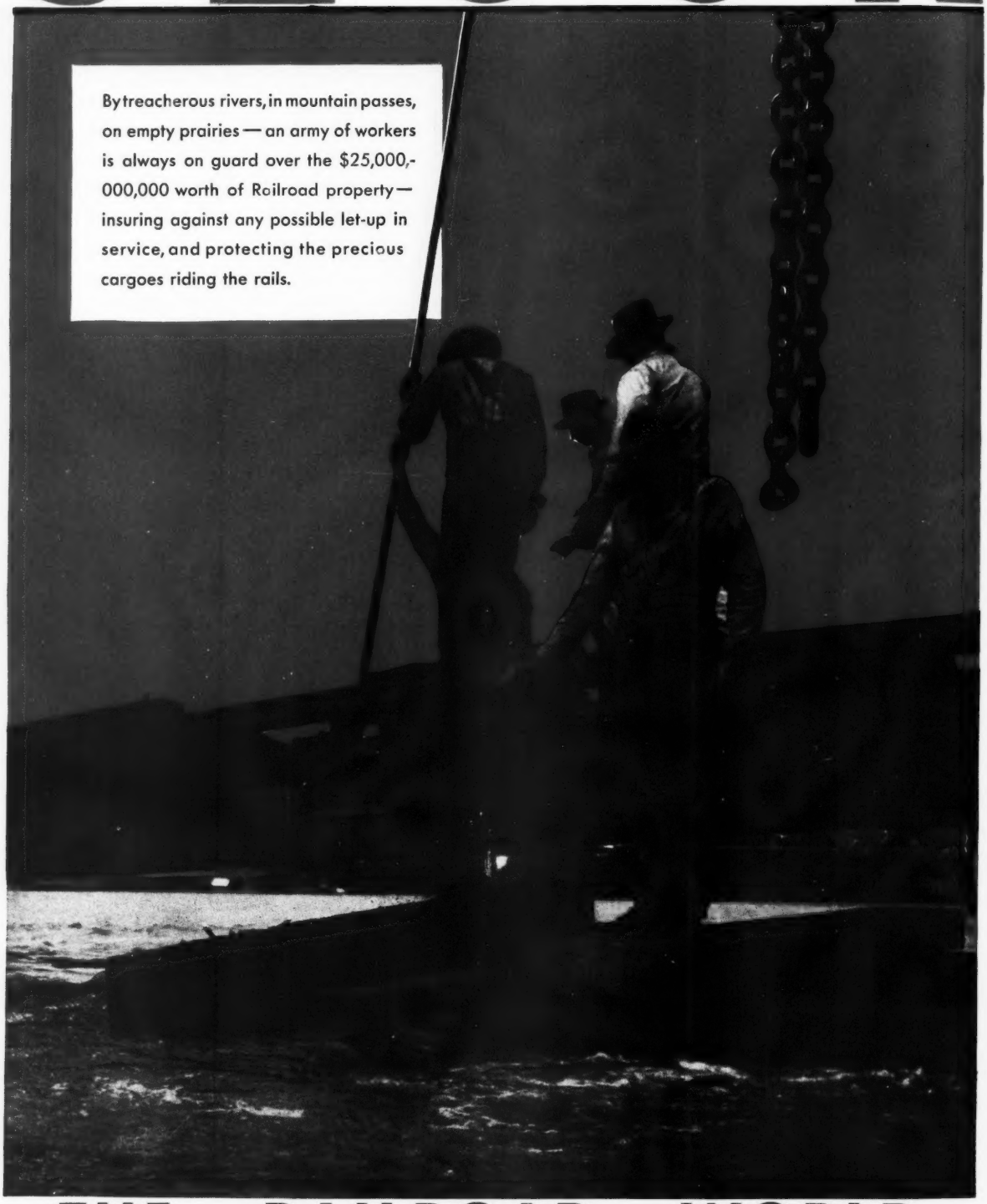
Alphabetical Index to Advertisers, Page 64 Classified Index to Advertisers, 60-62

SECUR



• THE • RAILROAD • WORLD •

ITY . . . .

While no price is too high to pay for security, the gigantic scale upon which the Railroad World operates demands that the cost be reasonable as possible. Every tool, every product used on maintenance work is carefully checked in service as to efficiency, dependability and cost of operation. No claims or guesses count—only facts and figures. The Railroad World KNOWS!

And the Railroad World KNOWS Fairmont Equipment—knows it to represent ***Lowest Overall Cost.*** That is proved by the fact that ***over half of all the motor cars now in use are Fairmont products!*** Few, if any, products used in maintenance work bear such an endorsement.

And as long as Railroads are operated on figures, the great majority of Motor Cars riding the rails will bear the Fairmont shield.

FAIRMONT RAILWAY MOTORS, INC.

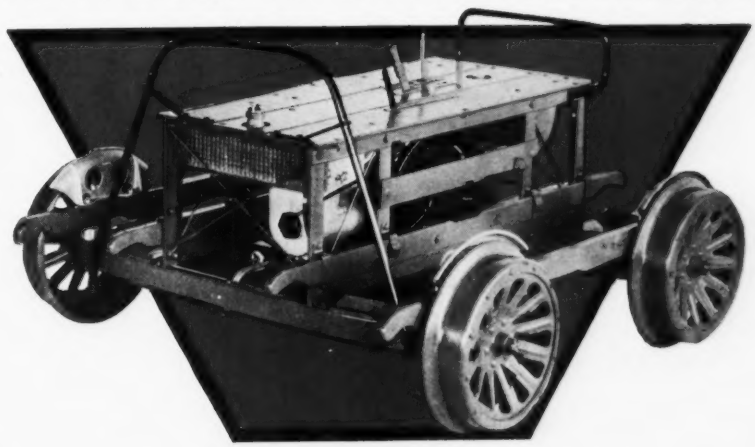
FAIRMONT, MINNESOTA, U. S. A.

General Sales Offices: 1356 Railway Exchange Bldg., CHICAGO

District Sales Offices: New York City Washington, D. C. St. Louis San Francisco New Orleans

FAIRMONT RAILWAY MOTORS, Ltd., Toronto, Canada *Foreign Representative:* BALDWIN LOCOMOTIVE WORKS

Manufacturers of section motor cars, inspection motor cars, gang and power cars, weed burners, ballast discars, ball and roller bearing engines, push cars and trailers, roller axle bearings, wheels, axles, and safety appliances



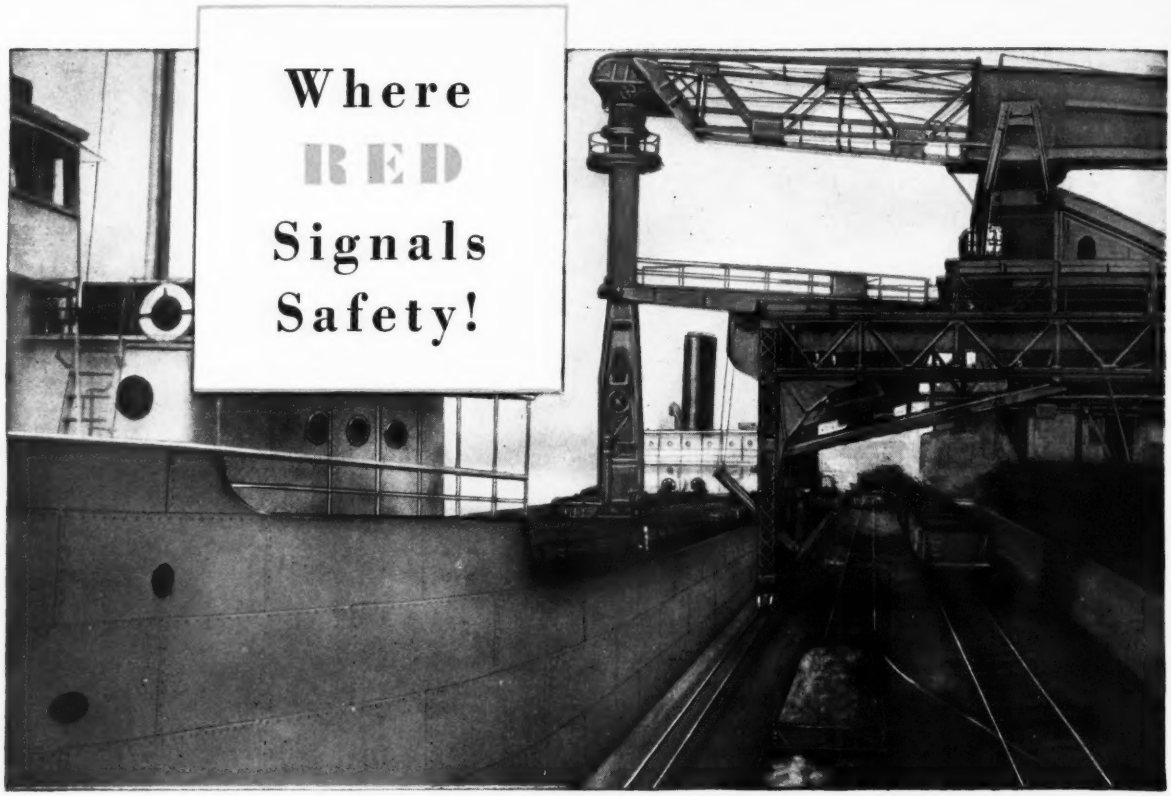
M19 Spring Mounted Inspection Car

This car is very popular with linemen and signalmen. Handles four boxes of battery renewals, two 10-gallon cans of water and two men—or, the car comfortably seats four men. Other inspection models include: C1—air cooled for one or two men, and MM9—water cooled for one or two men. Complete details at your request.

Fairmont Mudge

Performance on the Job Counts

• KNOWS • FAIRMONT •



Worth Erecting... worth Protecting

with RED LEAD

LARGE iron and steel structures exposed to the elements—dock and yard equipment, for instance—present a problem to engineers and others responsible for their proper maintenance. The larger the investment, the greater the possible loss through depreciation and the greater the need for the best protection modern science can provide.

Pure red-lead paint is recognized as the most effective barrier to depreciation in metal structures. It adheres tenaciously to iron and steel surfaces. It *seals out* corrosion—prevents moisture and other destructive agents from getting at the metal.

By specifying Dutch Boy when purchasing red lead, you are assured of obtaining a fine, uniform, highly oxidized pigment—a paint material that has the endorsement of engineers and technical men in many industrial fields.

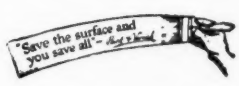
Dutch Boy Red Lead is available in two forms—paste and liquid. The latter—ready for the brush—is supplied in six colors—natural orange-red, light and dark brown, light and dark green, and black. The paste is available in natural orange-red and can be shaded to dark colors.

NATIONAL LEAD COMPANY

New York, 111 Broadway; Buffalo, 116 Oak St.; Chicago, 900 West 18th St.; Cincinnati, 659 Freeman Ave.; Cleveland, 820 West Superior Ave.; St. Louis, 722 Chestnut St.; San Francisco, 2240-24th Street; Boston, National-Boston Lead Co., 800 Albany St.; Pittsburgh, National Lead & Oil Co. of Pennsylvania, 316 Fourth Ave.; Philadelphia, John T. Lewis & Bros. Co., Widener Building.

DUTCH BOY

RED LEAD



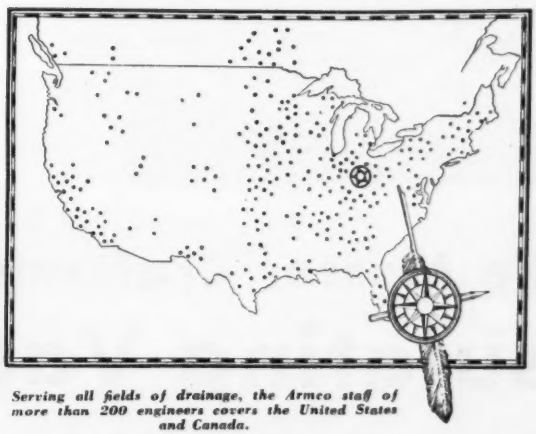

NORTHWEST
for handling
your containers
The L. C. L. container is coming! It's a real way to increase business and permits the use of cheaper cars for products that must be protected.
Handle these containers with a Northwest crane. It goes anywhere—travels over loading platforms or from gondola to gondola swinging the containers out to trucks or platform. No need to spot the cars under overheads or stiff legs!
Fourteen railroads are now using Northwests (one has 34) on all classes of work.
You will be interested in motion pictures of these machines showing their remarkable features. Let us show them to you. No obligation.
NORTHWEST
the
crawler crane
for flexibility

Significant facts mark

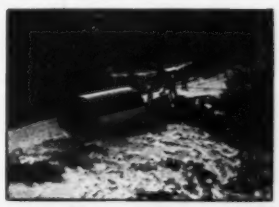
the 34th ANNIVERSARY*

of Corrugated Iron Pipe

The Armco Jacking Method, typical of the important methods developed by Armco engineers, saves 30 to 50 per cent of installation costs, where open trenching is impracticable.



Serving all fields of drainage, the Armco staff of more than 200 engineers covers the United States and Canada.



To combat erosion, Armco developed a pavement of bituminous material in the invert of the culvert. It is an example of "product" developments made by the pioneering Armco organization. Perforated Iron Pipe and Calco Automatic Drainage Gates are others.

"Headquarters" facts, comprising the most thorough and complete records of drainage research, field studies, and photographs, are compiled for ready reference at Middletown.

THE pioneering spirit and inherent leadership associated with the name Armco are deep-rooted in the earliest development of modern drainage. The Armco Culvert Manufacturers Association has studied all types and kinds of drainage products and materials and has revealed the facts which definitely establish drainage product values. Drainage Headquarters at Middletown possesses an extensive accumulation of data of which buyers and others make regular use.

"Under the roads" facts of performance, as developed from the field studies and investigations of Armco engineers, form the only true and complete basis for judging the strength and durability of drainage products.

Armco's exhaustive research led to its pioneering in improvements in methods, equipment, etc. The Jacking Method was originated by Armco to permit the laying of corrugated pipe through fills and under surfaces which must not be closed to traffic.

Perforated Iron Pipe, an Armco creation, solves the surface and subsoil drainage problems of railroad yards and terminals. It is widely used.

The Paved Invert Culvert, a revolutionary advance, is the Armco invention of an exclusive bituminous paving material applied to the invert of the pipe—to successfully combat erosion.

Advantages in aligning with Armco are many. For data on any phase of drainage, and new literature affecting the railroad field, write.

*May 5, 1896, the first corrugated iron pipe for drainage was invented by James H. Watson, of Crawfordsville, Indiana. Ten years later—in 1906—the first organized effort affecting modern drainage was made by formation of the Armco Culvert Manufacturers' Association. Today, more than 40 plants throughout the United States and in Canada, fabricate and sell Armco Corrugated Iron Pipe for all drainage purposes.

ARMCO
Corrugated Iron
PIPE

Armco culverts and drains are manufactured from the Armco Ingot Iron of The American Rolling Mill Company and always bear its brand.

ARMCO CULVERT MANUFACTURERS ASSOCIATION, *Middletown, Ohio*

HEAVY BALLAST AND A HIGH LIFT—

But a light, low-cost job for the NORDBERG POWER JACK

The Nordberg Power Jack instead of holding back tamping gangs the way hand jacks do, races away from the tampers. With it ONE MAN raises a mile or more of track a day!

It does not distort track alignment, even on curves, and hence eliminates necessity for expensive realigning work. And because of its screw-type lift, which permits "hair line" control, it makes possible much better resurfacing jobs.

The Nordberg Power Jack is effecting enormous economies on track work all over the country. Write today for location near you where you can see it in use and judge for yourself how it will cut costs on your track maintenance work the coming season.

Ballast spread to full height of rail

The tamping gang is having hard work keeping up with the jack.

Raise made in one lift

Behind the gang. Height of lift is indicated by fact that practically all ballast is under ties.

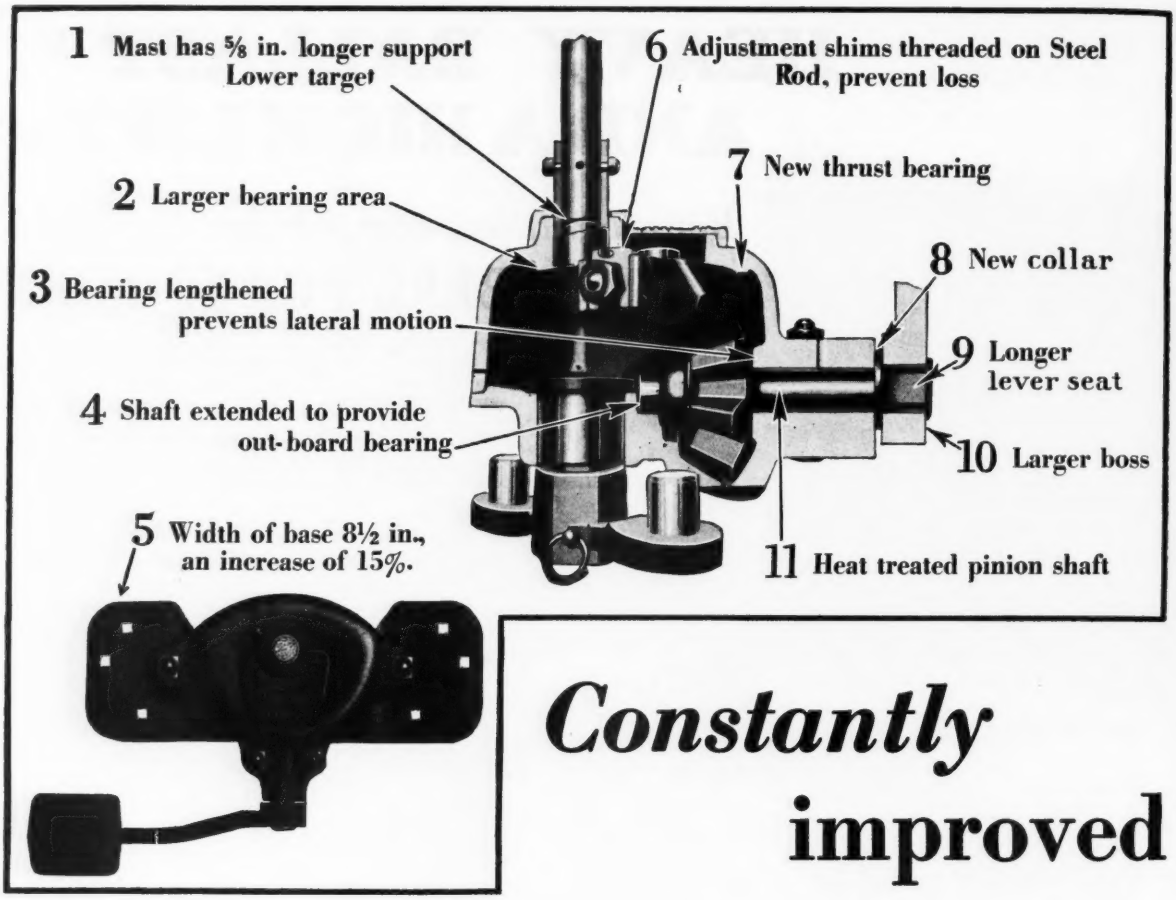
NORDBERG MFG. COMPANY

MILWAUKEE WISCONSIN

NORDBERG

SAVES TIME AND LABOR-REDUCES TRACK MAINTENANCE EXPENSES

POWER JACK



Constantly improved

ELEVEN improvements, shown in detail in the above illustration, give the Bethlehem New Century Switch Stand strength and ruggedness to stand up under the heavy-traffic conditions imposed on modern, high-speed, main lines.

Drop forgings have been substituted for certain of the parts originally made of malleable iron; heat-treated alloy steel has replaced ordinary untreated steel, and refined adjustments and improvements in other details have been introduced.

Further, the unusually heavy construction of the New Century Switch Stand, combined with a larger base area, results in much greater stability. The stand is firmly seated on the ties.

Constant improvement and refinement of the New Century Switch Stand have given it a position well in advance of present-day requirements. Improvements never affect the interchangeability of parts of the stand but are always developed in such a manner that they may be applied to stands already in service.

In yards and terminals where volume handling of freight traffic requires a low stand that combines positive adjustment and ease of throwing with safety for train crews, the New Century Switch Stand is finding increasingly wide use. "Free play" in the segment gear combined with a weighted throwing lever makes this stand easy to operate and assures positive closing of switch points.

BETHLEHEM STEEL COMPANY

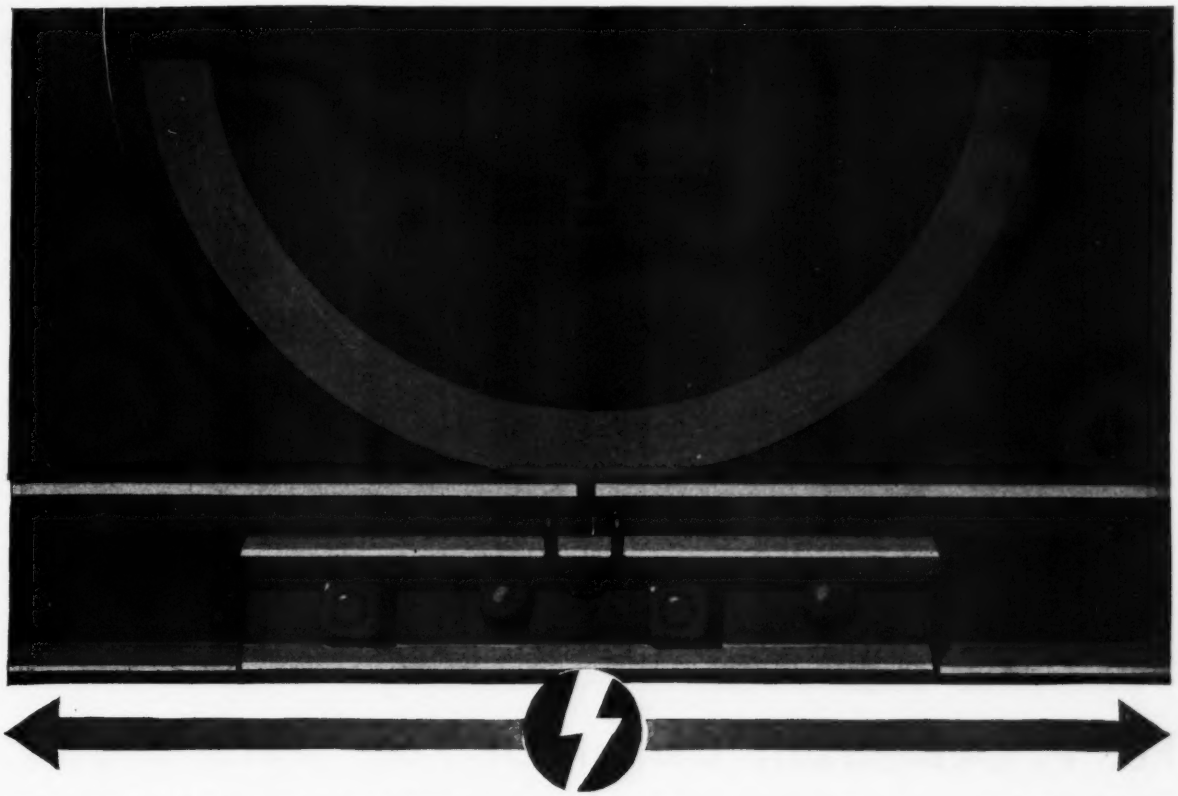
General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City.

BETHLEHEM
New Century Switch Stand



Rebuilt Rail Ends...Smooth as Glass!

THAT'S the result when TELEWELD PROCESS rebuilds your rail ends a mile at a time, electrically! TELEWELD PROCESS means years of added, extra service from every rail length. The TELEWELD PROCESS eliminates pre-heating. Welding heat is confined strictly to immediate surface of restored area. As a result, harder, tougher metals may be used, a greater penetration depth is secured and perfect fusion of old and new metal is obtained!

When the weld is completed, the rail end is surface and cross-ground to an extremely smooth, accurate surface. Rebuilt, the rail end is actually stronger and tougher than new!

Only trained welders, specialists in this work, are permitted to work on your steel. Thus, perfect workmanship is secured. Loss of motion and time is avoided. The job is completed faster...a half mile per day per unit!

TELEWELD PROCESS rebuilding is done on a contract basis. It fixes the responsibility for this important phase of rail maintenance. And don't forget that a part of TELEWELD SERVICE includes a survey of your steel without cost or obligation.

A sound suggestion is . . . send for the TELEWELD PROCESS engineer, now!

ELECTRIC RAILWELD SALES CORPORATION
Railway Exchange Building + Chicago

TELEWELD

A MILE AT A TIME

New York + Cleveland + Salt Lake City + Boise + Spokane + San Francisco

Laying an 8" Naylor Pipe line at a prominent western railroad.

For A Dependable Carrier Of Your Water Supply —Choose Naylor *Spiralweld* Pipe

CHIEF among the outstanding advantages of Naylor *Spiralweld* Pipe are *Strength* and *Long Life*---two distinct points of pipe difference and the two features in particular that make Naylor *Spiralweld* Pipe such a dependable water carrier.

For *Strength*, Naylor *Spiralweld* Pipe is made with a *Spiralwelded* lock-seam truss*which provides maximum structural strength and positive water-tightness.

For *Long Life*, Naylor *Spiralweld* Pipe is made of Toncan Iron, an alloy of iron, copper and Molybdenum which has superior resistance to rust and corrosion.

And in addition, the perfect roundness of Naylor *Spiralweld* Pipe and the smooth interior reduces water friction to a minimum. Consider this as an added value, for the dependable advantages alone justify its use. Bulletin 30-1 will be sent on request.

*This same truss structure makes Naylor SPIRALWELD Pipe one half the weight of standard weight wrought pipe. And light weight pipe is easy to handle. Ease of handling requires fewer men on the job. Less labor, consequently lower laying costs

NAYLOR PIPE COMPANY, Main Office & Plant, 1230 E. 92nd St., CHICAGO

SALES OFFICES

3116 Chrysler Building, New York
Witherspoon Bldg., Philadelphia
1209 First National Bank Bldg., Pittsburgh.
507 Philtower Bldg., Tulsa
601 Post-Dispatch Bldg., Houston

DUCOMMUN CORPORATION
LOS ANGELES SAN FRANCISCO
Exclusive Distributors:
California, Arizona, Nevada and Utah

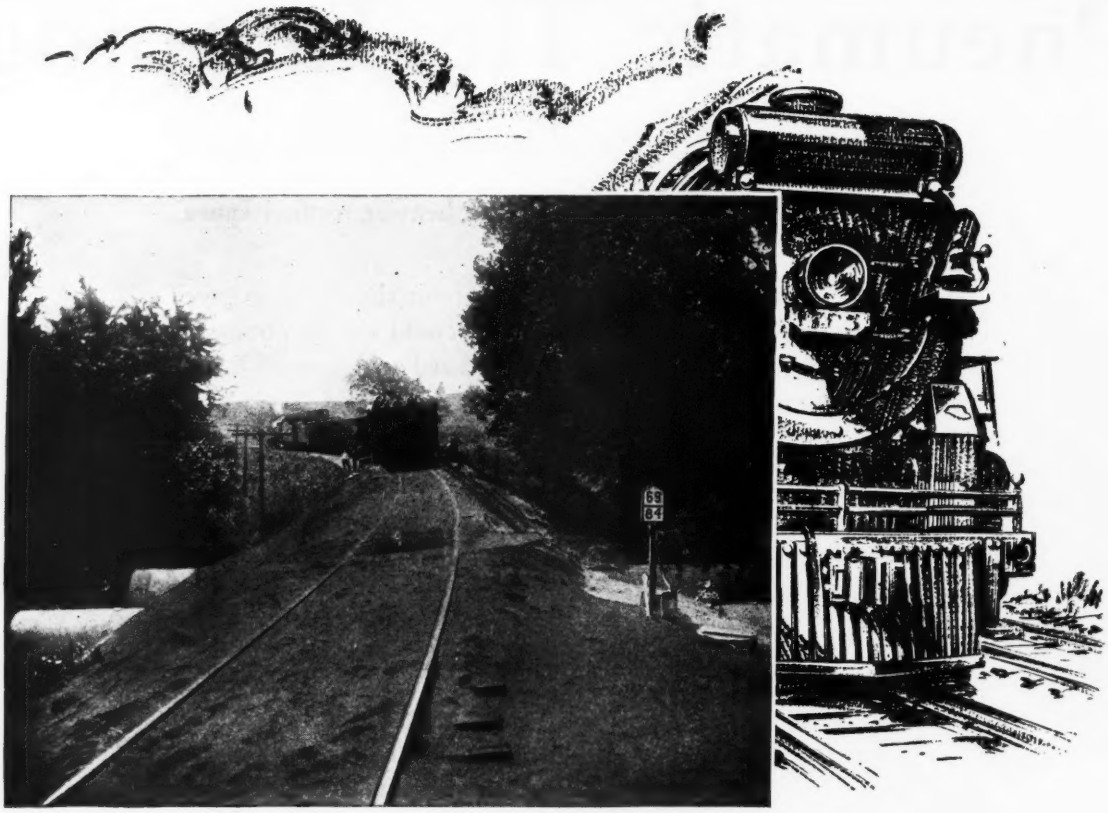
MONTREAL, CANADA
Mechanical Equipment Co.,
New Birks Building

TONCAN COPPER
Naylor Pipe
Maximum Structural Strength Mo-lyb-den-um With Minimum Weight
IRON

Standardized Naylor Pipe is made in sizes 6" to 12" I. D. and 14" to 20" O. D. in any uniform length desired up to 40' 0". Ends made to wrought pipe standards for all types of coupling.

Where corrosion is not a problem, Naylor Pipe can be furnished in steel.

Toncan Copper Molybdenum Iron is a development of Central Alloy Steel Corporation, the world's largest and most highly specialized alloy steel producers. It possesses a superior corrosion resistance, making it the favored pipe material.



Corrugated Metal For Flexible Strength
Toncan Iron For Permanence

VIBRATION travels far underground. The rumble of a passing train that you feel standing far away is felt by every culvert under or near the track.

In time rigid culverts crack under repeated vibrations and require replacement.

The flexible drain or culvert of Toncan Iron is unaffected by such shocks. Nor will ice and frost disturb it.

In addition to this structural advantage, Toncan Iron culverts result in a lower "cost-per-year" in the ground due to their superior resistance to rust and corrosion.

Toncan Iron builds up its well-known resistance to corrosion and erosion by the inclusion of copper and molybdenum. These elements give the naturally resistant iron a still further protection against rusting and corrosion.

For permanence at reasonable cost, install Toncan Iron culverts.

TONCAN CULVERT MANUFACTURERS' ASSOCIATION, MASSILLON, OHIO

Plants located in all parts of United States and Canada

TONCAN COPPER MO-LYB-DEN-UM **IRON**

Are your Crack Trains as modern as your patrons' homes?

A blunt question this, and one which you are quite likely to answer with an emphatic "Yes!" when you consider the lavish luxury you have provided for the comfort and convenience of your travelers . . . and yet, what of the plumbing fixtures? Are they the very newest "Standard" Plumbing Fixtures in color? If not, can you answer this question in the affirmative, recalling that color in plumbing fixtures is today accepted universally in better homes as the most modern and certainly the most decorative form of bathroom equipment?

"Standard" Plumbing Fixtures for railway service now are available in white and these beautiful colors: Ming Green, T'ang Red, Clair de Lune Blue, Ivoire de Medici, Ionian Black, Royal Copenhagen Blue, Rose du Barry, Orchid of Vincennes and St. Porchaire Brown. Write for a chart of these colors and further information as to the complete service this company renders to railroads.

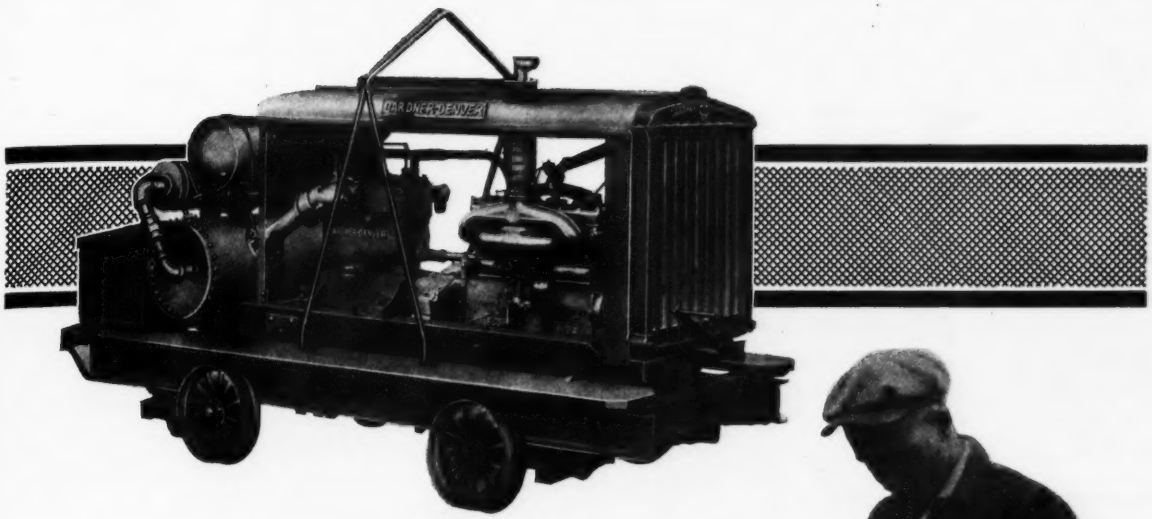
"Standard" PLUMBING FIXTURES

Railway Fixture Department

Standard Sanitary Mfg. Co. PITTSBURGH

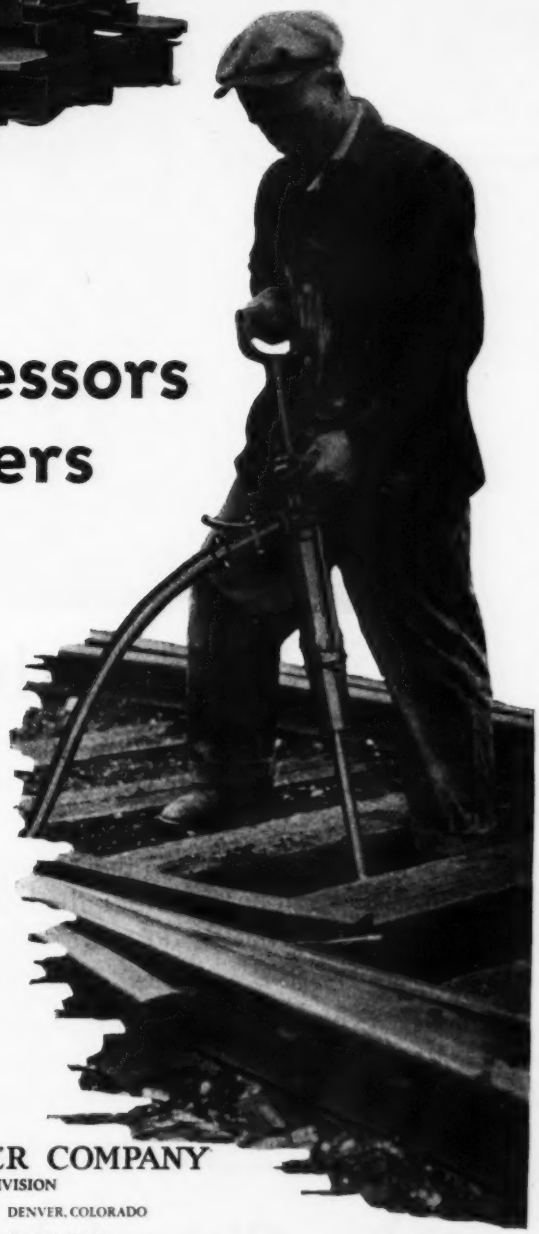
Division of

AMERICAN RADIATOR & STANDARD SANITARY CORPORATION



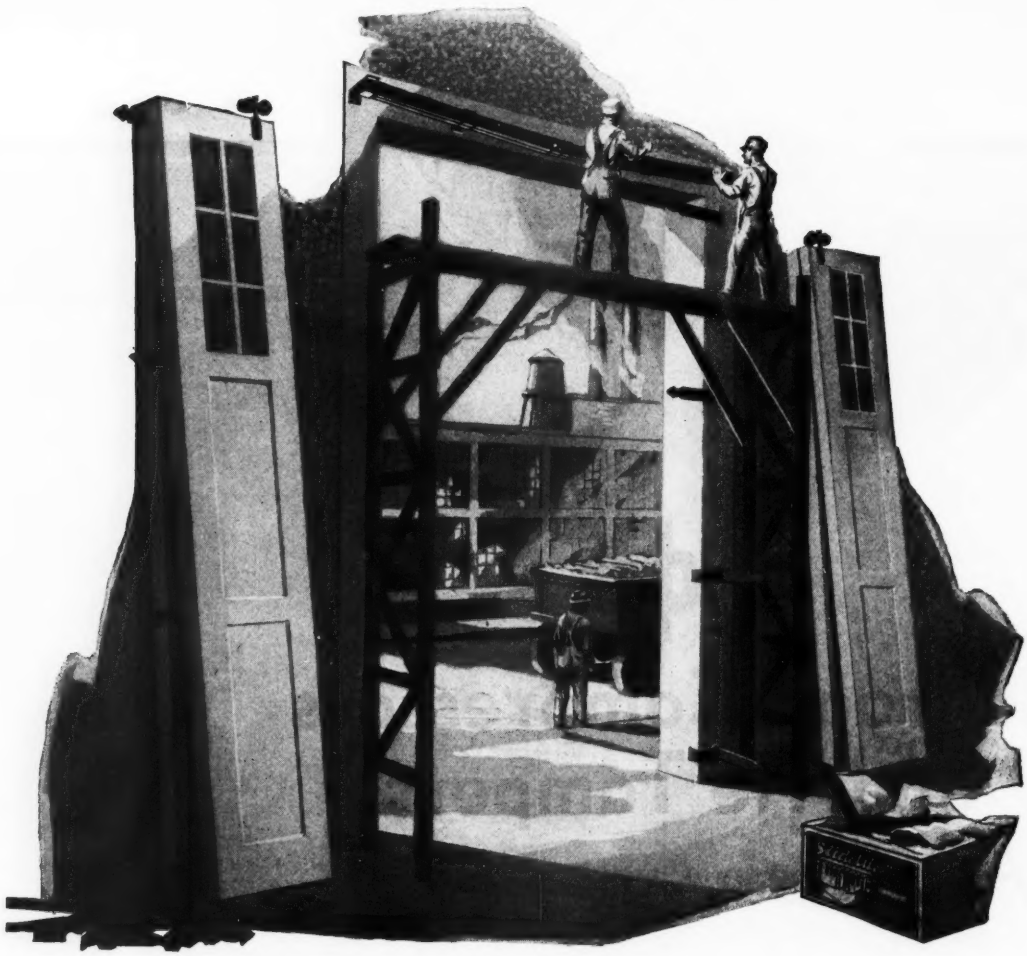
Railroad Compressors and Tie Tampers

ARE especially suitable for all types of roadbed construction and maintenance work, and their use insures rapid and correct tamping of ballast. The compressors are built in four sizes to efficiently operate four, eight, twelve or sixteen Tie Tampers respectively. They are equipped with easily operated transverse run-off wheels and with self-propelling mechanism when desired . . . Gardner-Denver Tie Tampers are correctly proportioned, sturdy tools with low air consumption . . . . . .



GARDNER-DENVER COMPANY
ROCK DRILL DIVISION
BOX 1020 DENVER, COLORADO
SALES OFFICES THROUGHOUT THE WORLD

GARDNER-DENVER



Doing the job over

YOU'D be surprised to know that a large percentage of our volume is in replacements.

Scarcely a day passes that one or more of our service branches are not called on to tell somebody what to do with doors that won't work.

In nearly every case, the trouble is that somebody — builder, architect, owner; generally owner—"saved money" on cheap door-hardware; and the result is that the job has to be done over. A door that's improperly equipped doesn't work; and a door that doesn't work is worse than no door at all.

"Doing the job over" is a costly operation; hardware too light for the work; or made to sell at a price; or mistakenly designed for its duty. The right thing even at a higher price would have cost less in the end.

Richards-Wilcox doorway engineers will show you how to avoid all this, if you ask them. Their service is free; but it is worth money to you.

RICHARDS-WILCOX R-W CO. AURORA TRADE MARK

"Quality leaves its imprint"

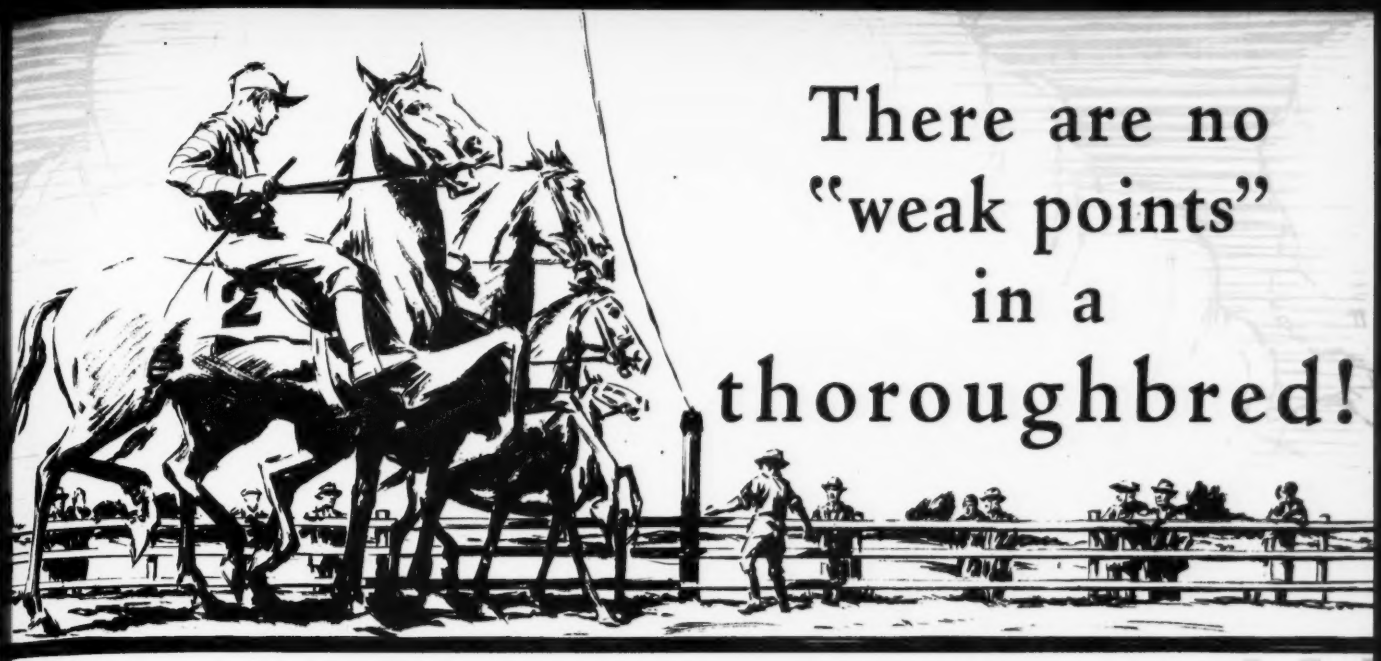
Richards-Wilcox Mfg. Co.

"A HANGER FOR ANY DOOR THAT SLIDES"

AURORA, ILLINOIS, U.S.A.

Branches: New York Chicago Boston Philadelphia Cleveland Cincinnati Indianapolis St. Louis New Orleans Des Moines Minneapolis Kansas City Los Angeles San Francisco Omaha Seattle Detroit Atlanta Richards-Wilcox Canadian Co., Ltd., London, Ont. Montreal Winnipeg

50 years 1880/1930



There are no "weak points" in a thoroughbred!

LOOK at them as they line up at the barrier! Thoroughbreds, all. No traces of doubtful lineage here. No "weak points" to mar blue-ribbon performance at the quarter post or in the stretch.

Quality tells—whether it's in horses or in railway motor cars. The Sheffield "44B," too, is a thoroughbred—proved on the steel rails of a continent! *Every* part of the "Sheffield" will stand the closest inspection as to design, material and workmanship. *Every* part is built to give maximum service. There are no "weak points" in a Sheffield Motor Car. That's why the "Sheffield" is the *lowest over-all cost car* on the market.

First on the rails—and *still first*

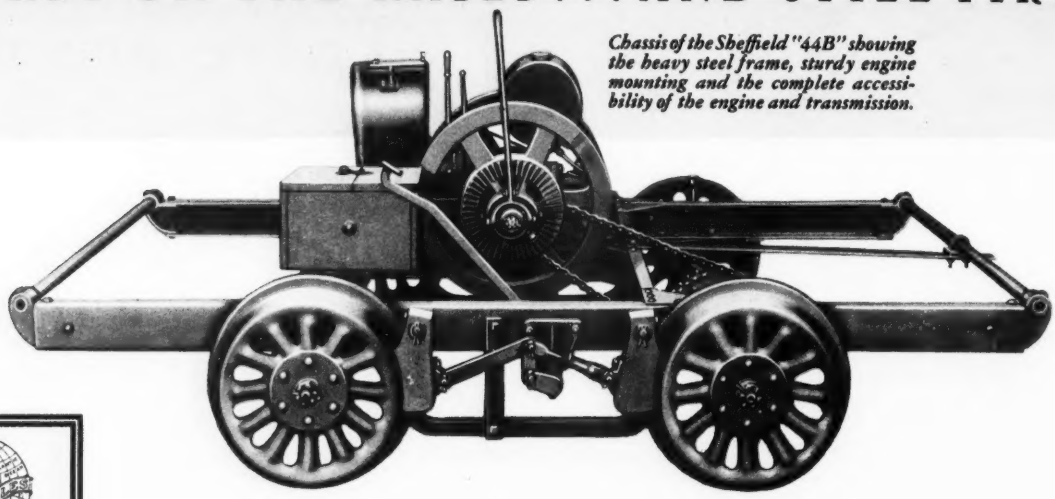
1930
begins the
SECOND CENTURY
of building
FAIRBANKS SCALES

TIMKEN BEARING
EQUIPPED

FAIRBANKS-MORSE
MOTOR CARS

POWER · PUMPING · WEIGHING EQUIPMENT

FIRST ON THE RAILS . . . AND *STILL FIRST*



Chassis of the Sheffield "44B" showing the heavy steel frame, sturdy engine mounting and the complete accessibility of the engine and transmission.

1930
begins the
SECOND CENTURY
of building
FAIRBANKS SCALES

You've got to have the slip . . . . . *but* you needn't have the *wear*

This is the secret of the low cost operation and long life of the clutch on the Sheffield "44B" Motor Car. It is *built* to slip *without* appreciable wear.

The constant clutch slipping that is necessary in motor car operation naturally plays havoc with belts. That means high replacement costs and frequent road delays. The "Sheffield" is driven by a roller chain through *a clutch that can't burn out.* The tough going and the "heavy foot" can't faze the "Sheffield" clutch. Rough handling can't put it out of commission.

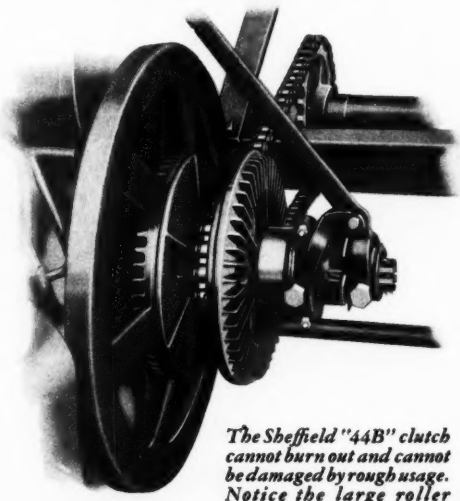
There's nothing complicated about this trouble-free clutch. Facings can be replaced easily on the road or in the shop in less than half an hour. But replacement is necessary only once in every five or ten years!

TIMKEN BEARING EQUIPPED

Perhaps you'll want to know more about the Sheffield "44B." *Every* part of the car is just as dependable as the clutch. We will send complete information promptly on request.

FAIRBANKS, MORSE & CO.
900 S. Wabash Ave., Chicago

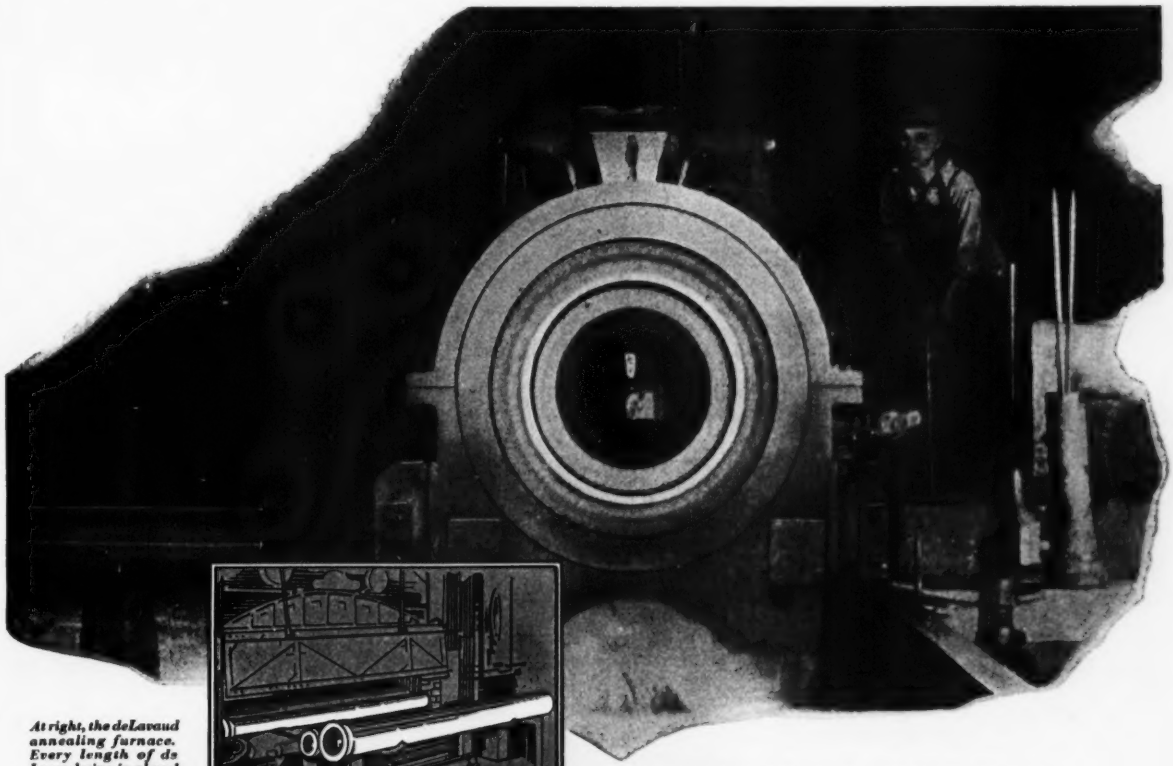
Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; stationary and marine oil engines; steam, power and centrifugal pumps; scales; motors and generators; complete coaling stations.



The Sheffield "44B" clutch cannot burn out and cannot be damaged by rough usage. Notice the large roller chain.

RA21.71

FAIRBANKS-MORSE
MOTOR CARS
POWER PUMPING AND WEIGHING EQUIPMENT



At right, the deLavaud annealing furnace. Every length of deLavaud pipe is placed in such a furnace where controlled heat uniformly anneals the entire length.

Above is a deLavaud machine in action. The tilting ladle shown in the background holds the amount of iron to form one pipe.

Sturdy, Flexible deLavaud pipe is always uniform in thickness

No chance of deLavaud pipe being "sided." A physical law assures the uniform thickness of the pipe walls. deLavaud pipe is made by pouring molten iron into a rapidly revolving cylindrical metal mold. The revolving action holds the iron against the mold with a force which at all points is equal to 40 times the force of gravity.

Immediately after coming from the machines, every length of deLavaud pipe is annealed in an oven where temperatures are accurately controlled. This controlled annealing is responsible for the flexibility of the pipe metal. It is the reason why deLavaud pipe is free from casting strains and is so satisfactory to cut and tap.

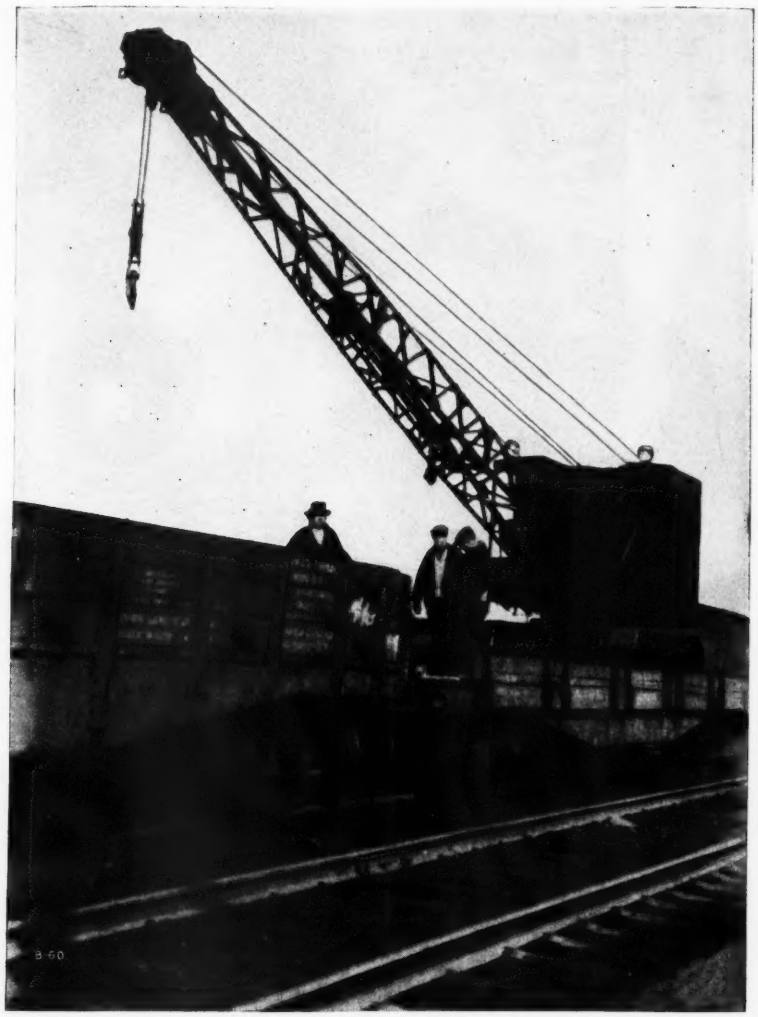
And, when it comes to strength, exhaustive tests by authoritative laboratories have proved that deLavaud pipe will stand 25% more pressure than any other cast iron pipe of equal thickness.

deLavaud pipe is manufactured in accordance with U. S. government specifications. We are also making and furnishing this product in the various thicknesses and weights shown in the specifications of the American Water Works Association and the American Gas Association. Write for complete information.

United States Pipe and Foundry Co., Burlington, N.J.

Our pipe bears the "Q-Check" trademark of The Cast Iron Pipe Research Association

Sales Offices: New York, Philadelphia, Pittsburgh, Cleveland, Buffalo, Chicago, Dallas, Birmingham, Kansas City, Minneapolis, Seattle, San Francisco, Los Angeles



The 2030 climbs on a gondola or flat car for transportation

RIDES A GONDOLA —READY FOR ACTION!

Handling ballast from a work train is an easy job with this machine. It rides in a gondola without dismantling; ready for action when you say the word—night or day.

But handling ballast is only one of its many jobs. The 2030 is easily converted to shovel, clamshell, dragline or crane. It's equally handy for widening right-of-way, moving stores, grading new sidings, shouldering high banks, or clamming a drainage ditch.

Because of its speed, power and reliability, the 2030 is used by leading railroads as standard maintenance equipment. Let us tell you more about the 2030.

Representatives throughout the U. S. A. and offices or distributors in all principal countries. *Branch Offices:* Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Dallas, San Francisco.

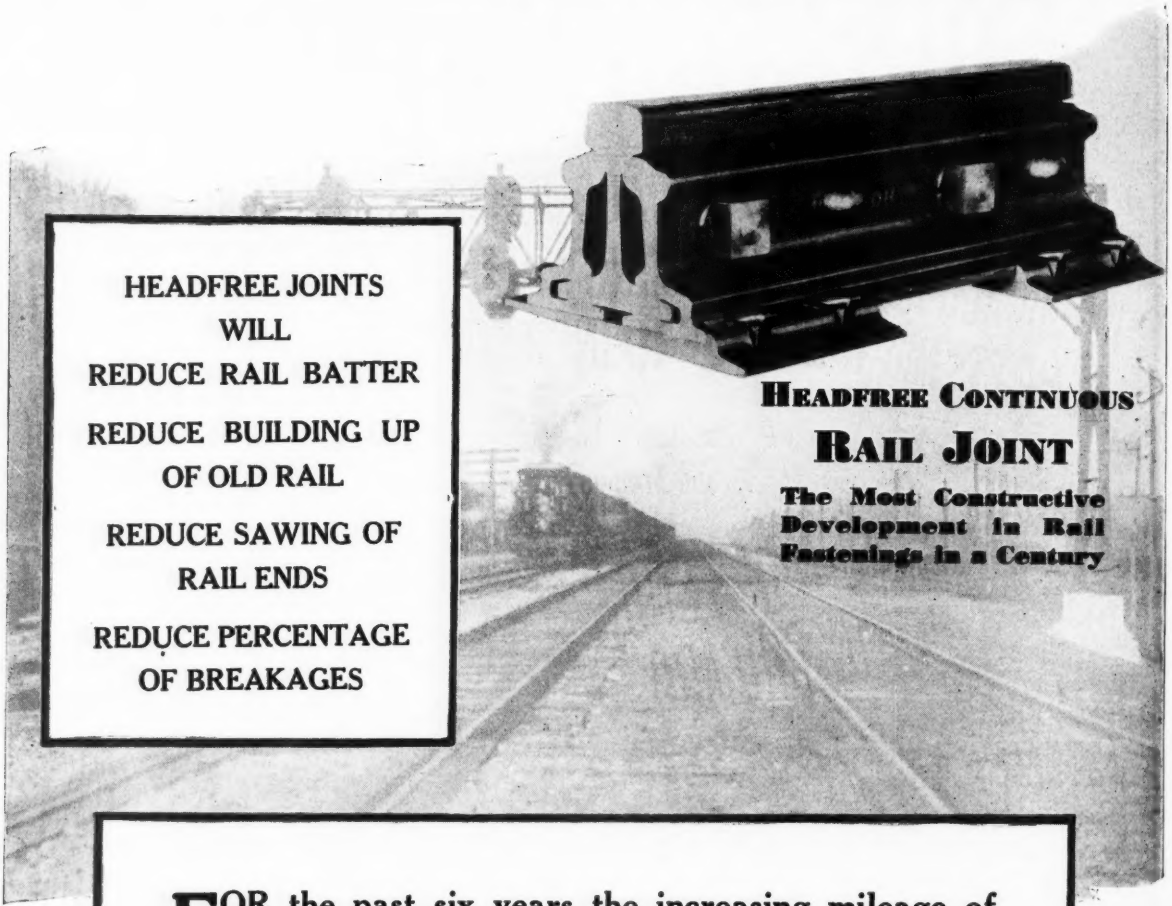
Clamming a drainage ditch.

A-78 5-30—REM

BUCYRUS-ERIE COMPANY, manufacturers of the only complete line—all sizes, types and powers. *Plants:* South Milwaukee, Wis., Erie, Pa., Evansville, Ind. *General Offices:* South Milwaukee, Wis.

BUCYRUS ERIE

A MODERN DEVICE FOR MODERN TRAFFIC



HEADFREE JOINTS
WILL
REDUCE RAIL BATTER

REDUCE BUILDING UP
OF OLD RAIL

REDUCE SAWING OF
RAIL ENDS

REDUCE PERCENTAGE
OF BREAKAGES

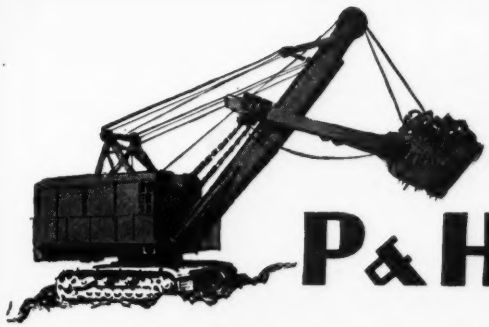
HEADFREE CONTINUOUS
RAIL JOINT
The Most Constructive Development in Rail Fastenings in a Century

FOR the past six years the increasing mileage of Headfree Rail Joints testifies that our customers are proving for themselves the value of this device as an economical and serviceable agency in coping with modern traffic, with its increasing number of trains, heavy loads and great speed.

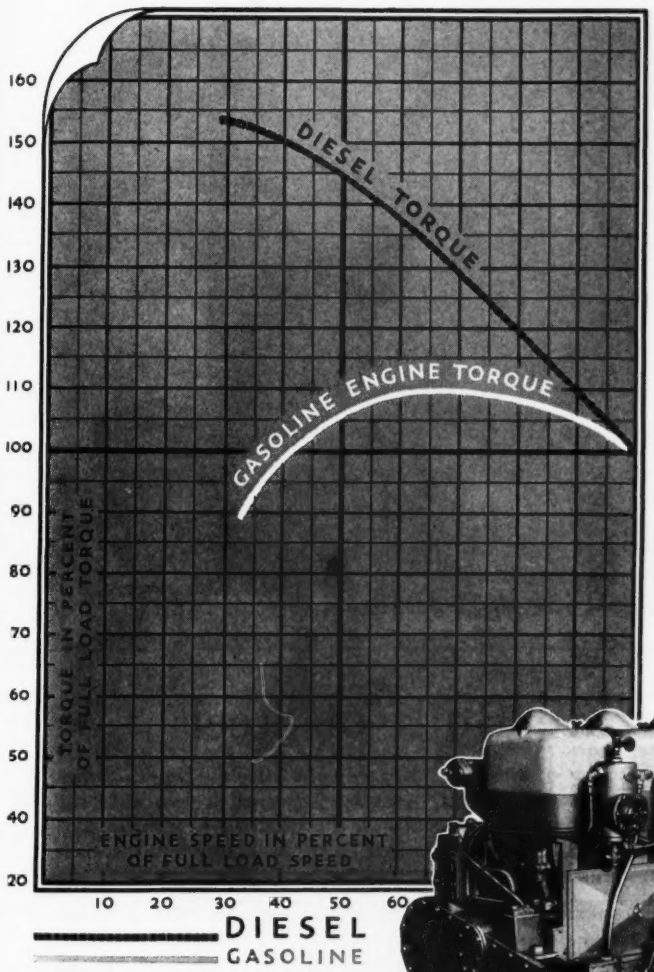
KEEPING PACE WITH PROGRESS

THE RAIL JOINT COMPANY

165 Broadway—New York



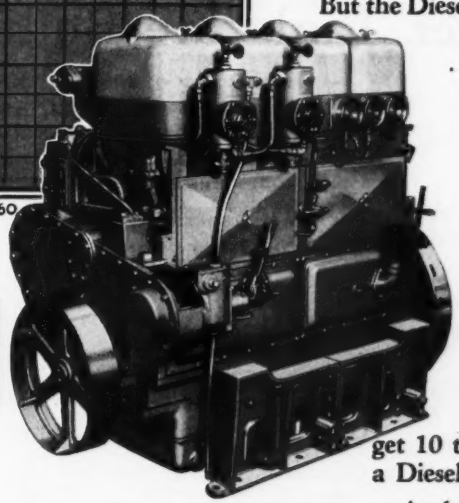
Why P&H Diesel Shovels *cut through* where others STALL



IN hard, tough digging—rock, hard-pan, gumbo, coarse shale—your shovel must work. The engine is frequently slowed down to low speeds.

And that is where the pinch comes. At very low speeds all internal combustion engines, except the Diesel, begin to stall. Their torque goes 'way down.

But the Diesel engine, even when slowed down below 50% of normal speed, increases its torque. It takes a more determined hold—gives you more power when you need it.



The graph illustrates the difference between a Diesel and a typical gasoline engine. It shows why the Diesel "hangs on" and cuts through where other engines stall. It explains why you can get 10 to 15% more yardage from a Diesel Shovel than from others.

And don't forget that in addition the Diesel saves from 75 to 85% in fuel costs as compared to gasoline.

For complete details of the P & H Diesel Excavator, write the HARNISCHFEGER CORPORATION, 3820 NATIONAL AVENUE, MILWAUKEE, WIS.

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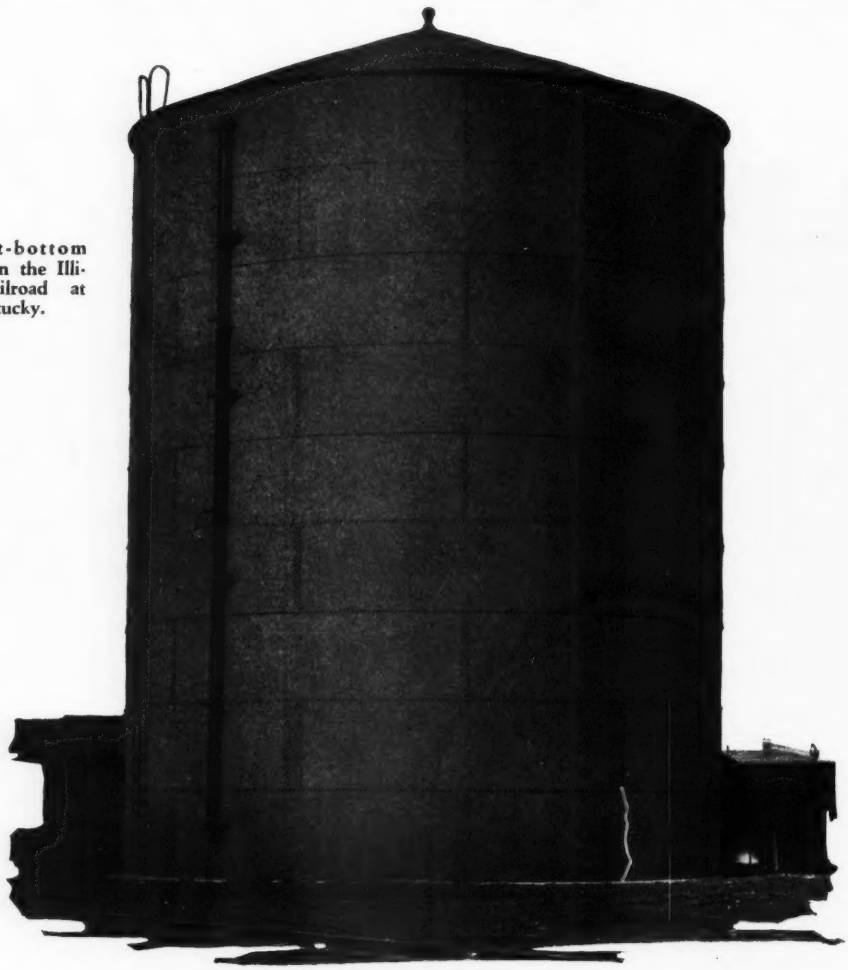
P&H *Diesel* **SHOVELS**

¾ TO 3½ CU. YDS.



500,000-gallon flat-bottom steel water tank on the Illinois Central Railroad at Paducah, Kentucky.

Water Tanks are Built of Steel

In this day of modern railway construction, water tanks are built of steel. Where gravity pressure is desirable for roadside delivery to locomotives, the conical- or ellipsoidal-bottom designs are preferable. In other instances, the flat-bottom standpipe type provides economical storage.

Steel tanks have a low maintenance cost. A coat of paint every few years keeps them in good condition. Substantially and simply designed, there are few parts of steel tanks which ever need replacing. Ask our nearest office for information or quotations on tanks for water stations you contemplate.

New Southern Plant
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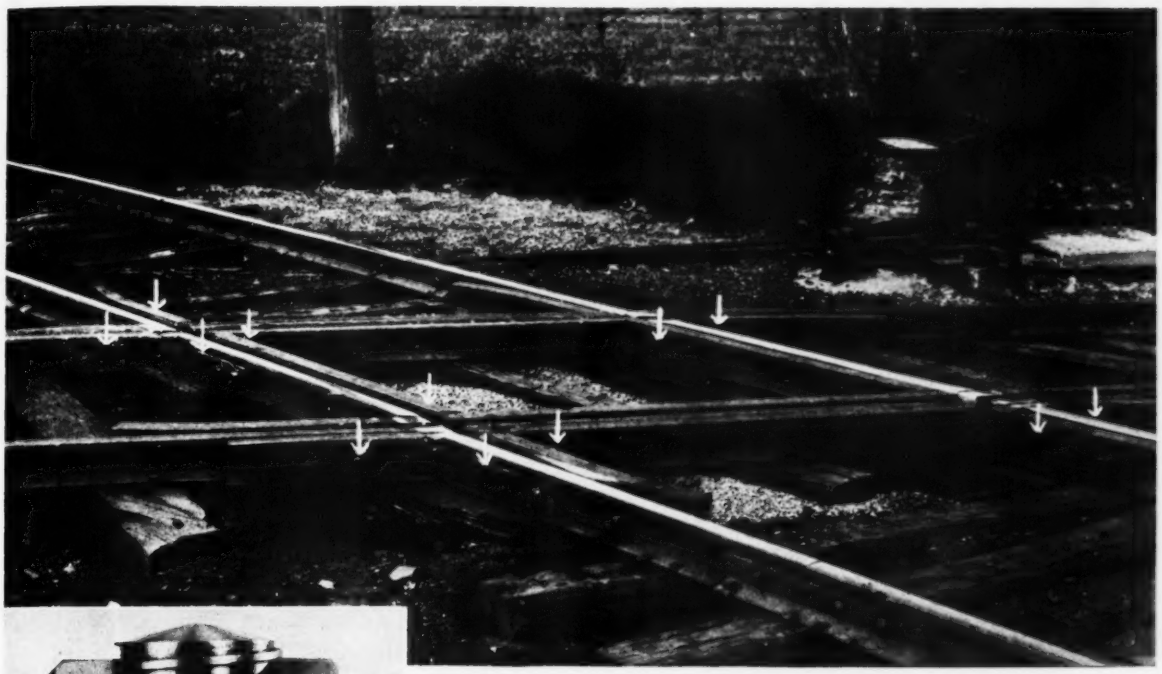
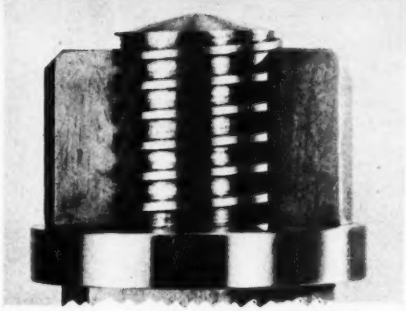
Dallas	3309 Magnolia Bldg.	San Francisco	1007 Rialto Bldg.
Birmingham	1546 50th Street, N.	Boston	1522 Consolidated Gas Bldg.

HORTON TANKS





The Dardelet Self-Locking Screw Thread in the locked position. Nut and bolt are in effect firmly wedged into one mass and they vibrate in unison when subjected to the jars and knocks of service. No accidental loosening of the nut is possible yet it can be adjusted or removed with the wrench without injury to the thread.

DARDELET

CROSSING FROG BOLTS HOLD SECURELY IN SEVERE SERVICE TEST

Every few minutes of the day and night an electric train passes over the crossing pictured above. In order to test the holding power of the Dardelet Self-Locking Screw Thread under severe service conditions, twelve Dardelet bolts and nuts were installed in the positions indicated. The remaining thirty-six bolts and nuts were U. S. Standard equipped with locking devices. When the crossing was inspected at the end of four months it was discovered that the U. S. Standard nuts had backed off, whereas the Dardelet nuts had not moved on the bolts and were locked in their original position.

The Dardelet Self-Locking Screw Thread is protected by patents and is manufactured in the United States under license from the Dardelet Threadlock Corporation.

DARDELET THREADLOCK CORPORATION

120 Broadway **New York, N. Y.**

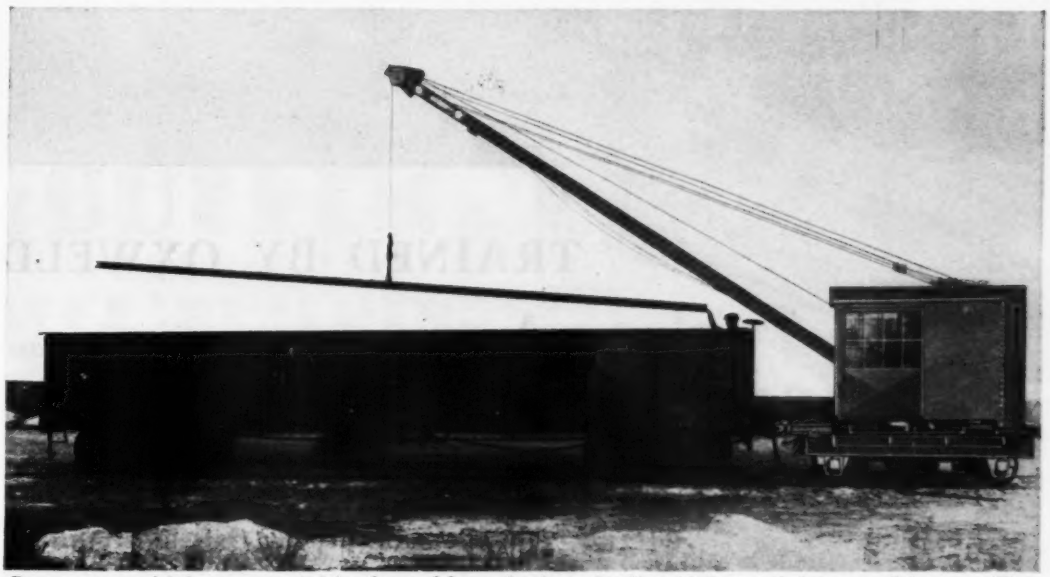
Model 20

BURRO CRANE

Model 30

Long Reach

for handling material in gondola cars



Burro crane with boom mounted in elevated boom heels, unloading 39-foot rail from gondola car. The sides of this car are 4 feet 8 inches high. The brake staff extends 6 inches above the sides and there is ample clearance between the brake wheel and crane boom. Note that the Burro is coupled to the car and is used to propel the car.

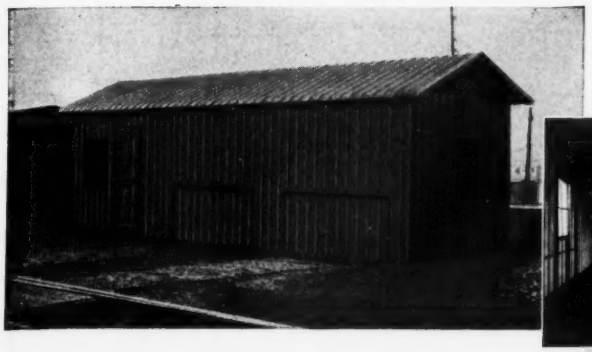
Burro Features

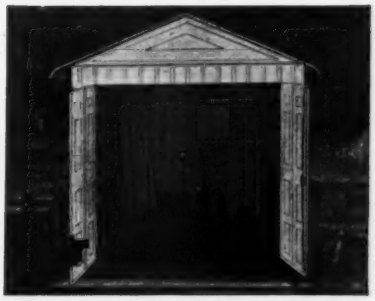
Utility
Long Reach
Low Overall Height
Travel Speeds
1½ to 20 miles per hour
Draw-Bar Pull
6000 to 7000 lbs.
Rated Capacities
Model 20 . . . . 11,000 lbs.
Model 30 . . . . 14,700 lbs.

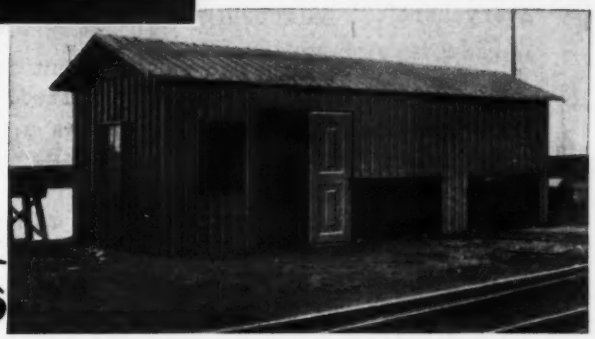
The standard 33 ft. Burro Crane boom, when mounted in the elevated boom heels, is sufficiently long to reach into high side gondola cars for handling long materials such as 39 ft. rail, yet this boom is short enough to permit loading the Burro, completely assembled, on one car for use in a work train or supply train or for shipment.

Cullen-Friestedt Company, 1300 South Kilbourn Avenue, Chicago

THE RAILWAY SHANTY IS PASSING







BUTLER READY-MADE STEEL BUILDINGS

Are Setting New Standards in Railway Structures

THE structures shown are popular types of shelters for motor track cars and tools. Scale houses, supply depots, dwellings, freight houses and car repair shops are some of the other railway activities which are logically finding shelter in Butler Ready-made Steel Buildings.

Fire safeness to offset lack of full fire protection along the right-of-way . . . complete materials, ready-made and readily transported . . . speed in erection by whatever labor crews are available or by Butler field crews . . . investment and maintenance lower than for any other comparable type of construction . . . structural features which insure permanence, yet which permit enlarging or taking down and re-erecting . . . these are some of the qualities which make Butler Ready-Made Steel Buildings so well adapted to railway needs. In them unique shaping multiplies the strength of steel. Throughout the maximum strength per pound is attained.

A new booklet pictures many types of installations. Send for it and call upon Butler engineers to supply full details.

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105 WEST ADAMS ST,
CHICAGO, ILL.

Subject: AWAKENING AMBITION

April 25, 1930

Dear Reader:
Everywhere

Not long ago an assistant foreman in the maintenance of way department of a large road was invited, with others who were eligible, to make application for appointment as a foreman to fill a vacancy that was bulletined. To the surprise of his supervisory officer this man asked to be excused, although he held seniority over all of the other candidates. When pressed for an explanation of his action, he stated that he had, for some time, been reading Railway Engineering and Maintenance regularly and that through the study of the articles published therein he had awakened to a realization of the fact that he did not possess the necessary educational qualifications to progress further. He added that, realizing his shortcomings in this direction, he had taken up a course of study to overcome his handicap and upon its completion he hoped to qualify for a position such as that which was then open.

This incident illustrates a benefit accruing from the reading of the technical literature in one's field, that is not always appreciated. It is commonly known that the constant presentation of information from month to month, relating to new and better methods and equipment tends to raise the level of efficiency of the industry as a whole. But here a loyal employee with years of service to his credit, was brought to a realization of the fact that his further advancement was limited by his lack of education, and he set about to correct this deficiency. That a second chance will come to such a man in due time is a certainty. That, with such determination, he will then make good is equally sure. When this promotion comes we will take a pardonable pride in the part that we have played in bringing it about.

Yours very truly,

Elmer T. Howson

ETH*MM

Editor.

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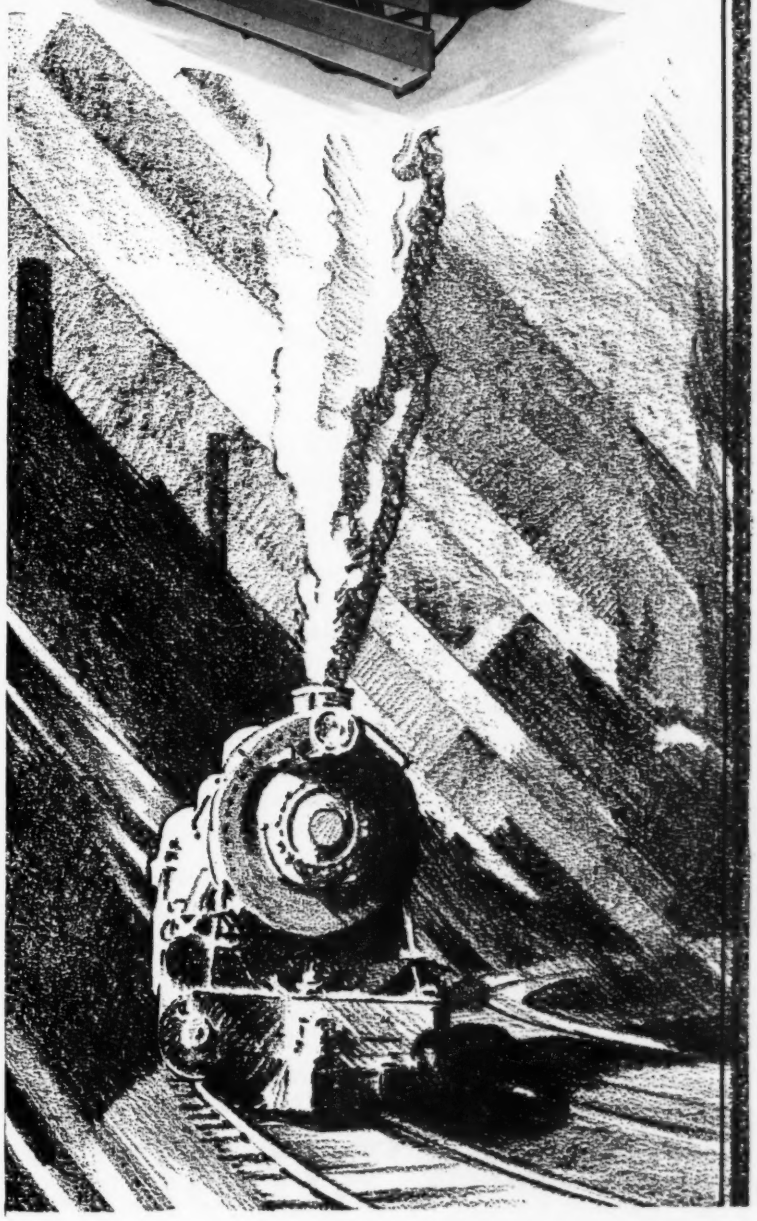
ESTABLISHED 1883



"Kalamazoo" stands today for **pioneering in the interests of the railroads** just as much as it did when railroading was in its crude, undeveloped stages.

NEW!

Kalamazoo Motor Car "39" (illustrated at the left) is a new heavy-duty car which is especially designed for transporting large extra gangs and hauling heavily loaded trailers or large equipment. It is powered by the standard Model A Ford Motor with selective gear transmission, and is equipped with the Kalamazoo reverse gear which makes possible the same speed in either direction.

It is exceptionally low in oil and gas consumption.

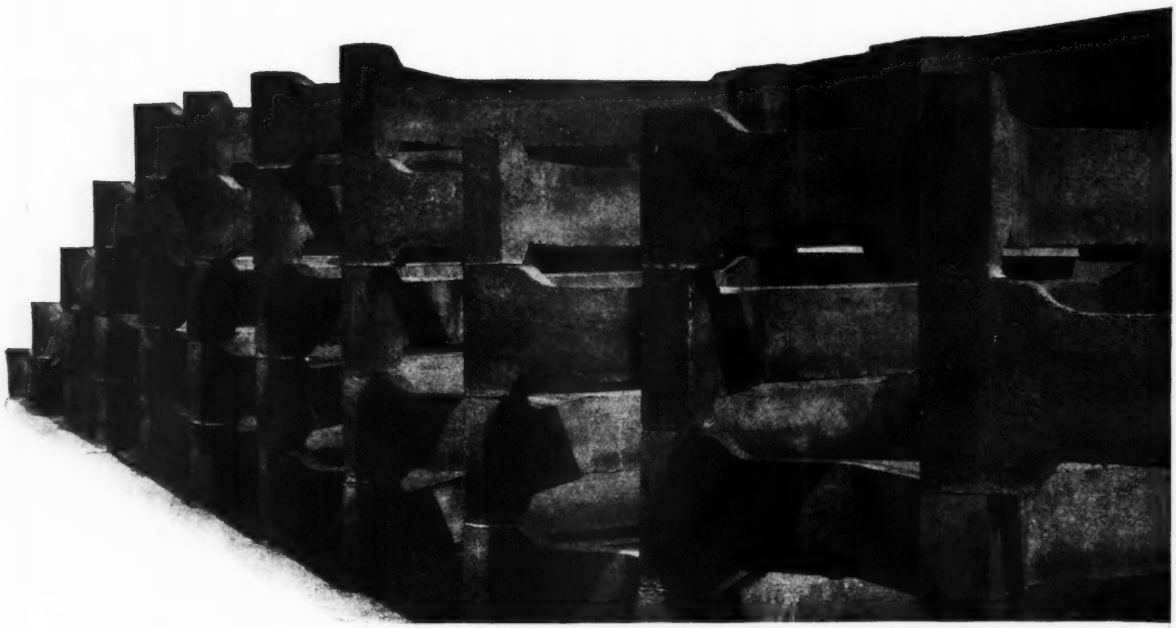
Twenty-eight men can be seated on it comfortably, and it hauls many more on trailers. Notice the deep tool tray along each side.

Write today for illustrated catalog information.

KALAMAZOO RAILWAY SUPPLY CO.

Manufacturers

Kalamazoo, Michigan



Rear view of a Federal wall ready for the fill. The great stability of this construction is apparent.

Stability

Showing the splendid closed face of a Federal retaining wall. It resembles fine masonry in appearance.

Note the solid, substantial rear of a Federal Retaining Wall. The Y-shaped ends of the headers form a unique interlacing anchorage in the back-fill without the use of a third member. At the same time, these headers with the face members, produce a cellular construction which encloses the fill in a great, close-knit mass.

Thus Federal, with but *two* units, forms a retaining wall of unusual strength and stability —saving material and labor costs to erect—yet with closed-face beauty that adds immeasurably to its value. And there is no maintenance!

Leading roads of the country are coming more and more to this construction. Data for comparison sent on request.

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Railway
Engineering and Maintenance

Volume 26 May, 1930 No. 5

Service Storage of Water

OWING TO the amount of water required for train operation, particularly on busy lines, the amount of water in reserve and the dependability of the supply, hold a place of equal, if not greater, importance with that of quality. This refers to the supply which can be drawn on continuously to meet the needs of traffic. This water may come from springs, wells, streams or lakes, or it may be contained in impounding reservoirs. Whatever the source, it is the function of the water service department to assure the continuity of the supply.

Insuring an ample and dependable reserve is not sufficient, however. The constant demand for accelerated service, which requires the speeding up of schedules and the elimination of all sources of delay, necessitates the highest practicable rate of delivery of the water to locomotives. This in turn raises the question of the service storage of the water. The method of storing the water and the storage capacity to be provided will be influenced largely by local conditions and the requirements of the traffic which is being served.

Storage in elevated tanks is the method commonly used, but in hilly country, stand pipes or hillside reservoirs are often more advantageous. This is especially true whenever the water is obtained from spring or streams at points of sufficient elevation to provide a gravity flow both to and from the service storage, in which case it may be possible to eliminate pumping entirely. Where tank storage is to be provided, the water consumption, as well as the character and dependability of the reserve supply, will determine the economical size of the tank. When practical, sufficient service storage should be provided to eliminate night pumping. A thorough study should be made of all of the factors entering into the problem, including the traffic to be served and the local conditions, in order that the solution may rest upon a sound economic basis.

A Contrast

In 1929 the Inland Waterways Corporation, which operates the Government barge lines on the upper and lower Mississippi and on the Warrior rivers, showed a net loss from operation of $354,000, without allowing any return on the $17,000,000 invested in property and equipment. In the same period, the tonnage handled by the barge lines declined six per cent, whereas that carried by the railways of the country increased four per cent.

As to regularity of service, operation on the upper Mississippi was suspended entirely for four months on account of ice and was maintained only irregularly at other seasons by reason of low water. Service on the lower river was likewise handicapped by the low river stage, while fog caused 11,382 hours' detention in the last five months of the year alone. On the Warrior river, the reports stated that high water interfered seriously with operation. In this same period, the railways provided the country with the most regular and efficient service in history, with an operating ratio of 71.69, as compared with 100.89 for the barge line.

Such is the contrast between waterway and railway transportation.

Economy in Starting Work Quickly

ONE of the railways, which has achieved unusual success during recent years in the conduct of its major operations of rail renewal and ballasting, has found that the results which it is securing from its forces this spring are far surpassing those of last year, which latter results were in themselves noteworthy. The improvement in performance this year is resulting, in part, from further refinement in methods. It is due even more, however, to the improved character of the labor that is now available. It is primarily by reason of this latter fact that two rail renewal gangs relaid approximately as much rail in March of this year as four similar gangs did in the same month a year ago.

The experience of this road offers one of the most convincing reasons for starting all possible work on this year's program as quickly as possible. The slackening of operations in many industries has released a large number of men who are anxious for work and who will deliver their best in order to hold a job. Many of these men are skilled workmen who would not normally accept employment of the type offered in track or bridge gangs. Men of this character are now available in and near all of the large industrial centers, who are willing to work for the wages the roads are able to pay, a condition which does not normally prevail.

In the face of this opportunity, not a few roads are still withholding authority to proceed with even that work which is admittedly necessary this year, even though the spring is now well advanced. If this work can be undertaken quickly and maintenance officers are permitted to recruit their organizations from the forces now available, marked economies can be effected—economies that should be most welcome in offsetting the present decline in net revenues. The present favorable situation will not prevail long. In fact, there are already numerous evidences of a

quickening in industrial activity that will rapidly bring an end to this situation. By taking advantage of the conditions that now prevail, a road can also assure itself of prompt delivery of materials, favorable weather for work and a minimum turnover in labor, all of which factors should, in the aggregate, permit reductions to be effected in the cost of labor, aggregating as high as 20 per cent. Such a figure is worth striving for. The more progressive roads are already securing it, and it is within the reach of others.

Because They Are Interested

WHEN members of national associations or local groups of maintenance of way officers are called together to select subjects to be discussed at a subsequent convention or meeting, the logical procedure is to consider the merits of each subject on the basis of the scope of its interest, whether or not it has received adequate treatment at earlier meetings and whether it is possible to find a suitable individual or committee that is adequately informed to deal with it. However, it is very hard for a chairman to confine discussion within these limits. Invariably some of those present will launch into protracted remarks on various phases of the subject itself and, not infrequently, a debate results in which two or more will take opposite sides.

This often consumes valuable time and delays the business at hand—that of deciding what subjects are to be chosen. However, it is of value in one way, in that it gives the chairman a measure of what is of interest. If he finds that his committee wants to discuss the subject "right now," the chances are good that it will be received with wide interest at the convention or meeting.

There is also another point to be considered. Men who cannot refrain from talking on any subject that has to do with their work, like their jobs. If maintenance of way men did not have this predisposition to go into detail on the pros and cons of their problems, their meetings and conventions would not amount to much. Picture the meeting where those who spoke did so only because they felt it was their duty, or because they liked to hear themselves talk!

A Notable Rail Program

FOURTEEN years ago the Pennsylvania adopted a program for the extensive use of what was at that time considered an unusually heavy rail. It has followed this program so consistently that today all of the rail in two of its main tracks and a large mileage of its third and fourth tracks between New York and Chicago is of the 130-lb. P.S. section, and rail of this section has also been applied in 5,620 miles of main tracks on other lines of its system. As outlined in 1916, the program called for the installation of 130-lb. rail in the main tracks of all of the heavy-traffic lines of this road, to replace the 100-lb. rail which was then the standard.

About 75 years ago, when the present line of the Pennsylvania from Pittsburgh to Chicago was under construction, iron rails weighing 50 lb. to the yard were removed from the tracks of the New Portage Railroad in Pennsylvania and brought out to the Middle West to complete the construction of the line through Ohio and Indiana. Following this, steel replaced the iron, and heavier sections were adopted from time to time, until, in 1887, 85-lb. rail became the standard on the Eastern lines, only to be replaced with the 100-lb. Pennsylvania section in 1892.

Progress was much slower west of Pittsburgh, however, and it was not until 1892, when preparations were being made to handle the increased business that was expected as a result of the World's Fair to be held in Chicago in 1893, that the Pennsylvania completed the laying of 70-lb. rail between Crestline, Ohio, and Chicago. This rail was afterwards replaced with the 100-lb. A.S.C.E. section, making 100-lb. rail standard over the system until 1916, when the 130-lb. rail was adopted as standard.

While the extensive use of heavy rail by this road cannot be taken as representative of the railways of the country as a whole, it is indicative of the trend toward a wider use of heavy rail which has been apparent in recent years.

Standardizing Wooden Bridges

IN ITS study of the standardization and simplification of storehouse stocks, the Committee on Wooden Bridges and Trestles found a great variety of sizes and lengths of bridge materials in actual use. As a result of this study it recommended, in its report to the recent convention of the American Railway Engineering Association, a more general adoption of the standard plans of the association in order to reduce the number of sizes which must be carried in stock, and stated, as a corollary, that if this were done, the problems of manufacture would be greatly simplified.

The discussion of the report brought out quite forcibly that, while there are recognized difficulties in changing from present practices to standard designs, these are of comparatively short duration, and there are compensations which cannot be easily ignored by alert engineering officers who are responsible for the wooden bridge construction on their respective roads.

Production figures in the lumber industry show that the output over an extended period runs approximately 60 per cent No. 1 Common or Poorer, 29 per cent No. 3 Clear or Better, and only 11 per cent structural grades. From this it is obvious that structural material cannot be produced on the same basis as other grades. It is also equally obvious that standardization of sizes, particularly of lengths, will simplify the problems of logging and mill operation.

At the present time logs are ordinarily cut to lengths of 32, 36 and 40 ft., because they yield the largest amounts of lumber, in lengths which are popular with consumers. Since any log is likely to be suitable for stringers or other bridge members, the mill is faced with the problem of disposing of the waste when an order comes in for 22, 24 or 26 ft. posts, caps, sills, stringers, or timbers of other odd lengths. For this reason structural sizes adapted for use in railway bridges are, at present, usually cut only as orders are received, and it often requires a considerable time before logs can be selected that are suitable for the required sizes and lengths.

Standardization would make it possible to buck logs suitable for these structural sizes into the required lengths as they are found. The mill could then cut the timbers and store them against future orders, where it is now unsafe to do so because there is no assurance that timbers of the lengths that may be cut can be disposed of in a reasonable time, if at all. Furthermore, with the assurance that inventories will be liquidated at frequent intervals, it will be profitable to provide storage under cover to protect the material against the damage which always results

from exposure of the newly sawed timber to the sun and rain.

There are two other important advantages which should result from standardization. If the mill has built up a stock of standard sizes, shipments can be made promptly, so that long delays in the receipt of bridge material and the resulting difficulty in carrying out annual programs of repairs or improvements will be eliminated, while it is almost certain that the quality of the material will be improved. Furthermore, waste at the mill will be eliminated and other costs of manufacture reduced, so that part or all of this saving can be passed along to the consumer. Standardization will result, therefore, in a two-fold advantage to both the manufacturer and the railway, while it will aid materially in the conservation of our natural resources.

Are Track Walkers Necessary?

THE track walker has long been a picturesque character in the maintenance of way organization. With his tools over his shoulder, he has figured in many advertisements of railway service for he epitomized the protection that is thrown about the traveler while he sleeps as well as during the day. Any suggestion that the track walker may be dispensed with strikes, therefore, at what has become an institution on many roads. Yet the mere fact that conditions in the past gave rise to even as colorful a character as the track walker should not bar present-day officers from asking whether these same conditions prevail today.

The track walker came into existence first at points where the road was subjected to the hazard of falling rocks, sliding hillsides and other abnormal conditions endangering safety of travel. Later as trains became more frequent and wheel loads heavier, the margin of safety between the track structure and the loads it was called on to carry narrowed, with the result that rail failures and other evidences of track weakness became more numerous. From this increasingly serious condition came the desire for more frequent patrol and inspection of the track, with the result that on the heavy traffic portions of a number of roads, track walkers were put on for continuous patrol, mile after mile. Even further, some roads were not satisfied with merely daytime protection and added night walkers for ordinary line patrol as well as at points of special hazard. As a result the cost of this service has grown to large figures.

That such protection has resulted in the detection of many hazardous conditions and in the prevention of numerous accidents is easily demonstrated. That it is as widely justified as it is now employed is not, however, so readily proved. This is due to the marked strengthening of the track structure in recent years.

There has never been a time when the track on heavy traffic main lines has been strengthened so rapidly as within recent years. The 85 and 90-lb. rail sections have been very widely superseded by those of 110 to 130-lb. Stronger joints, the more universal use of tie plates and rail anchors, more and better ballast and better drainage all contribute to a track that is much stronger in comparison with the traffic than that of a few years ago. This change in itself leads to less failures of a sudden or emergent character such as would be detected only by the frequent inspection of a track walker. Furthermore, this stronger track results in less wear and tear and resulting breakdowns of equipment, while the equipment itself is better maintained, thereby decreasing the hazard of equipment failure which the track walker is also supposed to detect in part.

By reason of the stronger track and equipment of today, there are less failures of a character which a track walker would detect. In other words, there is now less necessity for this protection to railway travel. In order to ascertain the extent to which the track walker is contributing to the safety of travel today, the chief maintenance of way officer of a road which has pioneered in the development of higher maintenance standards undertook an investigation of this subject recently, with the result that he found little or no concrete evidence in recent years of accidents that have been prevented by this patrol. With this information in hand, he was no longer in a position to justify the retention of the track walker and he has been eliminated at other than points of special hazard.

It is possible and probable that similar conditions prevail on other roads. At least the subject warrants investigation to determine whether the expense now being incurred for out-of-face line patrol is warranted by present-day conditions or is the result of precautions adopted to meet conditions which no longer prevail.

What of Next Winter?

THERE WAS a time when the proposal to use some form of heating device as a means of keeping switches clear of snow and ice during winter storms would be countered with a remark about the futility of "trying to warm all outdoors." But that day has passed and, following the well-remembered experience of the two unusually severe storms that visited the vicinity of Chicago during the past winter, interest in snow-melting devices in large railway centers is of a nature that points to extensive installations before snow flies again.

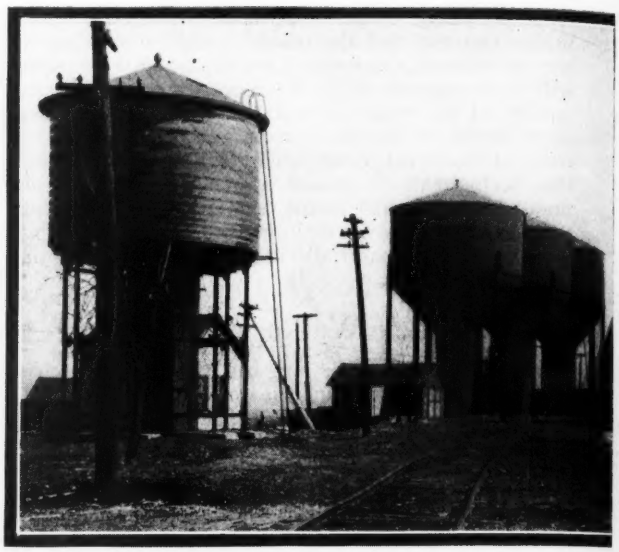
That there is more than one means available for increasing the reliability of switch operation during storms and of reducing the number of men required during such emergencies is indicated in the paper by C. E. Cox appearing on page 212 of this issue. It is also apparent that, regardless of the nature of the equipment provided, there is no substitute for an effective force of men thoroughly trained and employed in accordance with a carefully prearranged plan.

There is, however, an incidental value in the substitution of appliances for men that has much more force in fighting blizzards than it has in considering the general application of mechanical devices in maintenance of way work. Men engaged in fighting snow are working under much greater hazards than attend ordinary track maintenance operations. With 24-hour performance, more than half of the working time is in darkness, although visibility is low even during daylight hours. Furthermore, men bending over or shielding their faces from the wind and having their ears covered to keep out the cold do not possess their normal faculties for seeing or hearing. Added to this is the fact that the work must be conducted in congested locations, on multiple running tracks, where trains and engine movements are frequent and not in conformity with set schedules. Therefore, it is not only in the interests of economy and the maintenance of train schedules, but also in the interest of a reduction in personal hazards that snow-melting devices should be installed at locations where their usefulness can be demonstrated. That snow melters are now a live subject is indicated by the number of inquiries that have come to those railway officers who had experience with their use during the past winter.

Treat Two and One-Half

Facilities provided in the large yard of the Chicago & North Western at Proviso include a plant to soften water derived from both deep wells and streams

By R. E. COUGHLAN
Supervisor of Water Supply
Chicago & North Western, Chicago

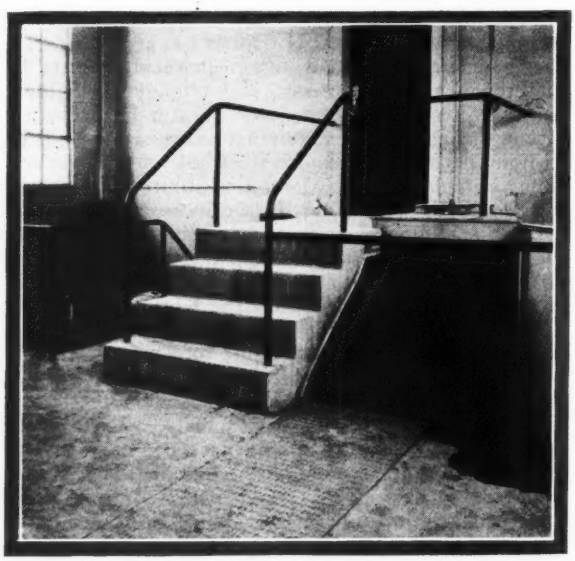


Three Steel Tanks Provide Storage for 450,000 gal.

WITH the opening of new freight terminal facilities at Proviso, Ill., which is now regarded as the largest individual freight terminal in the world, came the need for enlargement of the water supply facilities which had served the smaller terminal previously maintained at that place. This terminal is located 13 miles west of Chicago on the main line to Omaha and the West.

The original water supply was furnished from wells, five of which are approximately 1,800 ft. deep. These wells supply water containing 11 grains per gallon of calcium and magnesium bicarbonates with 5 to 8 grains per gallon of sodium bicarbonate. Four of these wells were operated with air lifts. The fifth well together with two additional wells, drilled to a depth of 1,200 and 1,600 ft. respectively, were operated with deep-well pumps. The two shallower wells supply a water which contains approximately 15 grains per gallon of calcium and magnesium bicarbonates and 3 to 5 grains per gallon of magnesium sulphate.

With the opening of the first unit of the new improvements, known as the North yard, an additional well was drilled to a depth of 2,050 ft. to provide water service for that unit. This well supplies approximately 300 gal. of water per minute, which contains 13 grains per gallon of calcium and magnesium bicarbonates and 5 grains per gallon of sodium bicarbonate.



The Sodium Aluminate Dry Feeder

Larger Supply Required

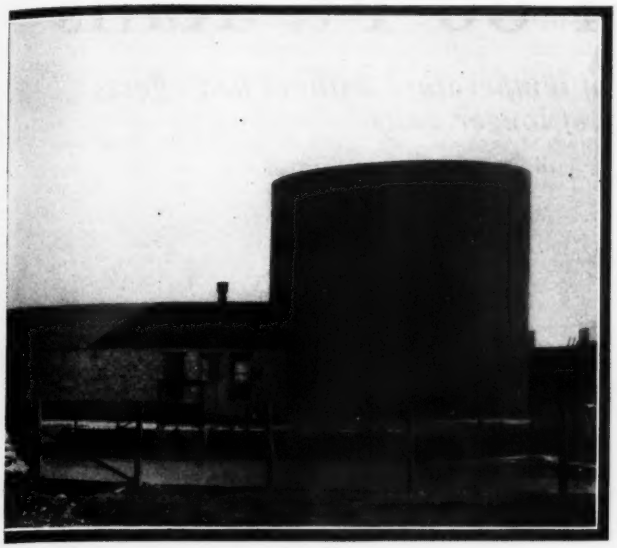
The total amount of water supplied by all of the wells in service was 1,750,000 gal. per day. With the enlargement of the terminal and the operation of from 20 to 40 locomotives of other railroads into this yard daily, it was found that 2,000,000 gal. of water per day were required, exclusive of that supplied for sanitary use. Storage facilities were provided at the engine house for 450,000 gal. in three 150,000-gal. steel tanks.

Observation extending over several years showed that the water supply from the deep wells was gradually becoming more unsatisfactory as to both quantity and quality, as well as from the standpoint of economy of deep-well pumping. This led to a consideration of other possible sources of supply. The nearest pipe lines of the City of Chicago, which obtains water from Lake Michigan, are approximately eight miles away, with three suburban towns lying between the ends of these lines and the yard. The quantity of water that could be obtained from surrounding suburbs was limited and the quality comparatively poor for boiler use.

There are in the vicinity several small streams which are fed from seepage and drainage, one of which flows through the yard south of the engine house. This creek was dredged and diverted into an 800,000-gal. reservoir, into which the output of the wells is also discharged as needed. The creek itself, after dredging, acts as a secondary reservoir, insuring approximately two days' supply.

The surface water and drainage flowing in this creek contain from 2 to 6 grains of calcium and mag-

Million Gallons Per Day

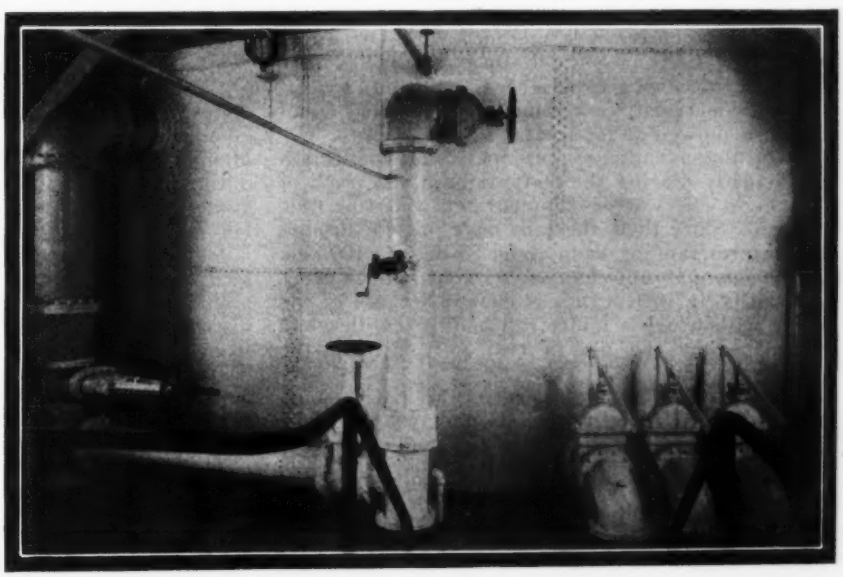


gal. of Water—Treating Plant at the Right

nesium sulphate, as well as from 16 to 25 grains of calcium and magnesium bicarbonates. This water is softened either alone or after being mixed with the water from the wells, together with all of the water used in the engine house for washing boilers, cooling compressors, etc., all of which is returned to the reservoir.

From the nature of the water supplied from these various sources, it was obviously necessary to provide treatment. Accordingly, a complete lime and soda-ash plant with a capacity of 1,800 gal. per min. was installed. This plant consists of an 800,000-gal. steel tank of the standpipe type, having 600,000-gal. softening and reaction space with 200,000-gal. storage space. The tank and equipment are of Graver construction with a Sparling meter control.

Sodium aluminate is added after the introduction of lime and soda ash by means of a National Aluminate Corporation dry feeder of the LP type. This consists of a steel hopper of 300-lb. capacity supported over the center of the revolving plate and ball-bearing centrifugal pump. The dry aluminate is fed on this plate by gravity, the amount being controlled by means of an adjustable sleeve collar. It is scraped off the plate into the dissolving box, whence it is led into the pump, which forces it to the point desired in the reaction tank. The chemical tank, the dry feeder and the main pump are all set on a depressed foundation, thus enabling the operator to recharge the chemical tank from the floor of the storage room with a minimum of labor.



Control valves at the base of the treating tank—Sludge Valves on the right

Reclaim Water Discharged with Sludge

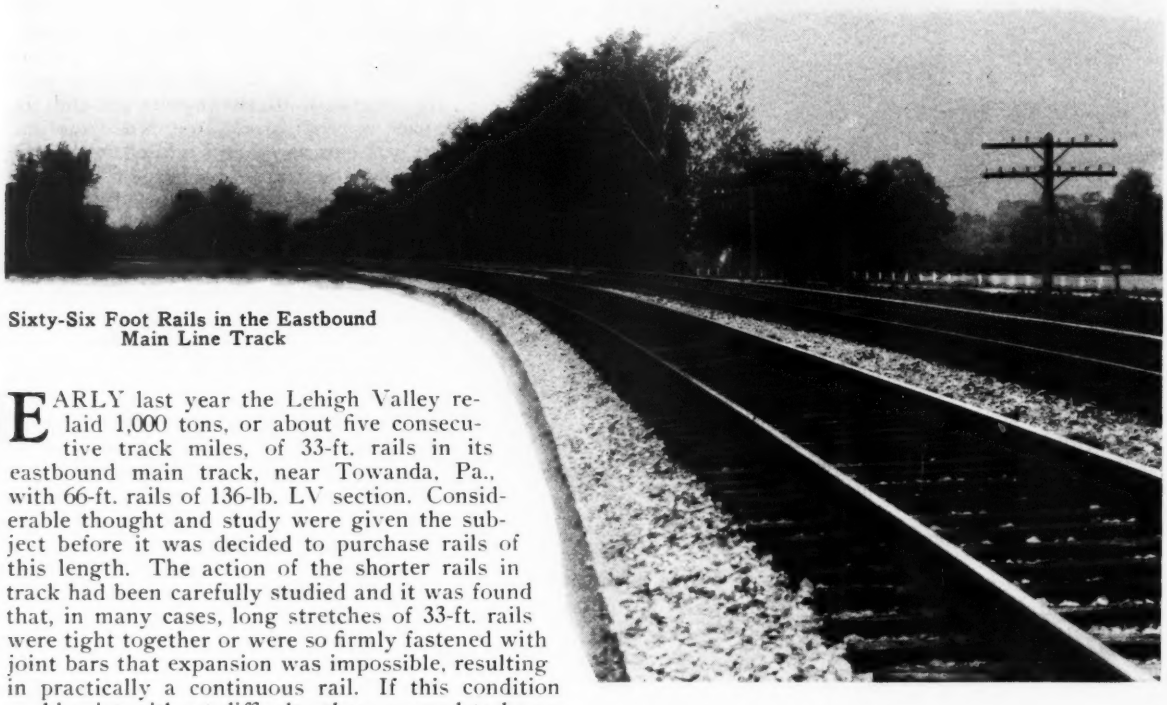
The sludge is discharged from the steel tank by means of a manifold system in the bottom of the tank, which is connected to three 12-in. quick-opening valves. This sludge is run through a tile line to a pit west of the reservoir. Between this pit and the reservoir, a space approximately four feet wide and eight feet deep was excavated and refilled with sand and gravel so that the water discharged with the sludge seeps back through this improvised filter bed into the reservoir.

Since the operation of the plant was started in January, analysis of the unsoftened water shows a hardness varying from 12 grains to 35 grains per gallon. By close supervision of the plant, it has been possible to provide a softened water that has a content of from 1 to 2 grains per gallon of temporary hardness and from 1 to 3 grains of sodium carbonate. With an 800,000-gal. storage of surface water and a 650,000-gal. storage of softened water, an ample supply has been maintained at all times with a minimum of deep-well pumping.

The pipe lines across the main yard and extending over to the north yard are interconnected so that in case of shortage at the north yard water can be transferred from the softening plant. A separate system supplying water from one of the deep wells has been installed for drinking purposes. While the present facilities appear to assure an ample supply for some time to come, the survey shows that additional streams a short distance away can be diverted to the reservoir and provide an increase in the supply whenever it is needed.

Lehigh Valley Lays 5 Miles of 66-Ft. Rails

Economies in laying, and wide range of temperature without bad effects prove practicability of longer units



Sixty-Six Foot Rails in the Eastbound Main Line Track

EARLY last year the Lehigh Valley relaid 1,000 tons, or about five consecutive track miles, of 33-ft. rails in its eastbound main track, near Towanda, Pa., with 66-ft. rails of 136-lb. LV section. Considerable thought and study were given the subject before it was decided to purchase rails of this length. The action of the shorter rails in track had been carefully studied and it was found that, in many cases, long stretches of 33-ft. rails were tight together or were so firmly fastened with joint bars that expansion was impossible, resulting in practically a continuous rail. If this condition could exist without difficulty there seemed to be no reason why longer rails should not be used.

It has been common practice on the German State Railways for some time to use rails 30 meters, or 98.42 ft. in length, and in many cases these long rails are welded together. A conference with Dr. Buckholtz of the German State Railways indicated that no trouble was being experienced, insofar as expansion was concerned, even though very limited openings were allowed at the joints.

All of the advantages anticipated in connection with actually placing the 66-ft. rails in the track of the Lehigh Valley were demonstrated when the rails were laid. Since then, the rails have passed through temperatures ranging from about 35 deg. to 100 deg. F., with many abrupt changes, without fault or trouble. Rail 66 ft. in length was chosen because of the facility with which a faulty rail of this length could be replaced by the use of two 33-ft. rails if the necessity arose.

These 66-ft. rails were rolled at the Lackawanna plant of the Bethlehem Steel Company at Buffalo, N. Y. They were of excellent quality, and as straight as any 33 or 39-ft. rails which had been purchased previously by that road.

The rails were shipped to Towanda in 40-ft. low side gondola cars with drop ends, two cars being used to a rail length. From 40 to 45 rails were loaded in each pair of cars, the bottom layers of rails being given six points of support, three in each car. In moving the rails over the road, there was no movement on the supports other than the small amount which occurred as the rails passed over curves.

No Difficulty in Laying Rails

Laying of the long rails was accomplished in a manner entirely similar to that which has been used in laying 33 and 39-ft. rails on the Lehigh Valley during past years; that is, by means of locomotive cranes. The first two miles of rails received were laid on March 23 under traffic, while the last three miles were laid on April 15, when exclusive use was secured of the track.

Prior to the actual relaying operations, the rail was distributed along both sides of the track, directly from the road haul cars, by maintenance of way department locomotive cranes equipped with standard 50-ft. booms. These cranes, without alteration other than the substitution of a special pair of rail tongs for the single rail tongs ordinarily employed, were used in setting the rails in place. The special arrangement consisted of two tongs separated by a 10-ft. spreader bar, which, in turn, was carried by the hoisting rope of the crane in a balanced position. While this arrangement was not essential to the handling of

the longer rails, it simplified matters somewhat in that it precluded the necessity of finding the exact center or balancing point in each rail in order to handle it properly.

Throughout the laying of these rails, the temperature ranged from about 35 to 40 deg. F., and the rails were laid practically tight. Since then, the rail has gone through the extremely hot weather of the past summer, with abrupt temperature changes, with entire success, notwithstanding the fact that the entire five miles was raised and surfaced during the hot weather without any tendency for the track to swing out of line, or, as sometimes experienced, to become "kinky."

The track construction where the 66-ft. rails were laid is similar in every respect to the present standard main line track construction of the Lehigh Valley stone ballast, six-hole, 38-in. angle bars, 20 treated ties to the 33-ft. panel, double-shoulder tie plates weighing 22 lb. each, with two cut spikes holding the rail, one outside and one inside, one plate anchor cut spike at each end of the ties, and a sufficient number of rail anchors to keep the rail from creeping. The track in which the 66-ft. rail is laid is also typical of a large mileage of tracks on the Lehigh Valley, in surface, superelevation and alinement, so that the installation of long rails is entirely comparable with other sections of the road. The grade on the test sections is slight, nowhere exceeding 0.09 per cent, and the maximum curvature within the test section is three degrees.

As a result of the ease with which the five miles of 66-ft. rails were placed in the track, and of the observations which have been made since their installation, the officers of the Lehigh Valley are satisfied that, from a structural and maintenance standpoint, the 66-ft. rail is practical and conducive of large economy. In the first place, records on the division on which the long rails were laid show that the 66-ft. rail was laid

Looking Over a Section of the Five Miles of Track Laid with 66-Ft. Rails

at somewhat less cost per ton than 33-ft. rail, not only because of the fewer number of rails which it was necessary to handle but because of the fewer number of joints and bolts which it was necessary to apply.

Since the five miles of 66-ft. rails have been in the track, the temperature has ranged from 35 deg. to over 100 deg. F., and at no time has there been evidence of excessive expansion or contraction. In fact, the rail has, for all practical purposes, remained exactly as originally placed.

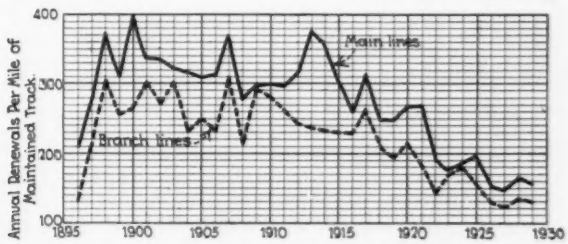
The study and investigation on the Lehigh Valley leading to the decision to install the 66-ft. rails on

A Typical Rail Joint in the 66-ft. Rail Territory After Several Months in Service

that road were carried out under the direction of G. A. Phillips, chief engineer of maintenance. The rail was laid under the supervision of R. E. Patterson, division engineer, at Sayre, Pa., and Daniel Oakes, supervisor of track, at Towanda.

Tie Renewals Decline on N. P.

SINCE the Northern Pacific commenced using treated ties in 1907, the average tie renewals per mile on that road have decreased by approximately 50 per cent. In 1913, before the increased life of the treated ties which were inserted in 1907 had exerted any noticeable influence on the number of renewals, these renewals amounted to an average of 379 per mile on main lines and 236 on branch lines. Since that time, the number of tie renewals has decreased almost uniformly until in 1929 the average number of ties renewed per mile in main line tracks amounted to 158 and in branch lines to 132. Stated in another manner, the percentage of the ties renewed to the total number of ties in the track has declined from 12.6 in 1913, to 5.3 in 1929 for main lines



This Diagram Shows the Average Number of Ties Renewed per Mile of Track for Each Year Since 1896

and from 8.4 to 4.7 for branch lines. These figures are calculated on the basis of an average of 3,000 ties per mile for main lines and 2,800 per mile for branch lines. The marked reduction in tie renewals is further illustrated by the diagram which shows the results for main lines and branch lines plotted on separate curves.

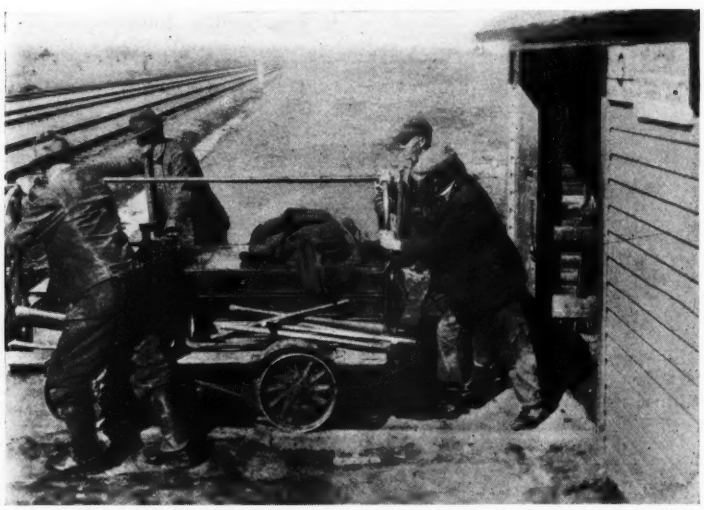
This road has two large treating plants, one situated at Brainerd, Minn., and the other at Paradise, Mont., which were placed in operation in 1907 and 1908, respectively. Up to the end of 1929, the plant at Brainerd treated 10,475,972 ties and the plant at Paradise 10,184,192 ties, making a total of 20,660,164 ties treated by the two plants.

Motor Car Accidents

Are Preventable*

Hazard can be eliminated by proper observance of rules—Injuries due to disregard of reasonable precautions

By D. A. KUEBLER
Office Engineer, Kansas City Southern, Kansas City, Mo.



A Poor Start—Careless stowing of tools on the car may lead to an accident.

PROBABLY a larger percentage of the accidents resulting from the use of motor cars are preventable than those of any other class. Back of almost every such accident is a violation of some safety rule or recognized safe practice. The importance of concentrating upon the reduction of those accidents is evident when it is realized that, out of a total of 59,966 reportable injuries to employees on duty in non-train accidents on all railroads in the United States during 1927, 3,094, or more than 5 out of every 100 were in connection with the use of motor cars. The seriousness of the motor car accidents is borne out by the fact that, while they included only slightly over 5 per cent of the total number of injuries, they produced 21 per cent of the fatalities, and there were 22 deaths per thousand motor car injuries as compared with 4½ per thousand of other injuries.

Cars Must Be Properly Equipped

If motor car accidents are to be avoided it is the duty of the company to provide safe cars with appropriate safety devices and a systematic method of maintaining them in safe condition. Side-load cars are not as safe as those with the engine in the center and, under ordinary conditions, the latter are more desirable.

New cars should either be purchased completely equipped with safety devices or such devices should be applied before the cars are placed in service. Among the safety devices that should be applied to all motors cars are substantial safety rails across the front and rear, connected with a rail above the center of the cars to provide handholds and prevent men falling off, and guards for fly wheels and other moving parts to insure against getting clothing, tools or material caught in them. Another device, comparatively new, but very desirable for many types of cars, especially with the high sections of rail now being used, consists of a safety rail placed lengthwise between the wheels under each side of the car to prevent the wheels from hanging on the rail when the car is being removed from the track. The heavier cars that are used largely for inspection purposes should be equipped with an approved type of safety bar, so designed and placed that in case of derailment the car will slide along on the bars on top of rails. These bars must be durable and substantially fastened to the frame. There are various opinions as to the merits of safety bars, some contending that the possibility of their becoming displaced and derailing the car, and their interference with placing car on and off of track, largely offset their advantages. However, in the operation of inspection cars there is usually enough help in handling them so that the interference of the safety bars is negligible, and if they are well built and properly installed there should

*Abstracted from a paper presented before the annual meeting of the Safety Section, American Railway Association at Indianapolis, Ind.

be little possibility of their causing trouble. We have been using some of them on our line and find them very desirable for inspection cars that cover considerable territory.

Cars should be provided with the necessary guards or compartments to carry the required tools in positions where they will not be in the way and cannot fall off. No unnecessary boxes, loose seats or other attachments should be permitted on cars.

Suitable set-offs should be provided and, particularly where motor cars are in section service, they should be of ample size and not more than one-fourth to one-half mile apart, the distance depending on track alinement, traffic and the difficulty of removing cars from track between set-offs. Obviously they should be closer together on high fills and adjacent to narrow cuts or long bridges.

Men Must Be Familiar with Rules

If uniform and general observance of safe practices is to be obtained it is necessary that detailed rules governing the operation and care of motor cars be furnished every man in charge of a car, and that specific provisions be made to see that the rules are understood and complied with. Each foreman should be made personally responsible for the operation of his car. Where sufficient cars are in use to justify, it may be advisable to assign inspectors to check up regularly on the observance of the rules and the qualifications of those in charge, and to detect any abuse of cars. Wherever the need becomes evident, further instructions and advice, in addition to the published rules, should be given personally to those in charge of motor cars by inspectors or others competent to do so.

It has been demonstrated that the examining and licensing of automobile drivers materially reduces accidents and there is no apparent reason why a similar plan should not have the same result in the operation of railway motor cars. This may be in the shape of an informal examination and permit, but should be thorough and should be made a matter of record. A man's mental and physical fitness, particularly with reference to vision, should be definitely established before a motor car is assigned to his use. With cars in gang service, the actual handling of a car should be delegated to a young man who is fully capable, alert and has a knowledge of gas engines, the foreman assuming the responsibility. This gives the foreman more opportunity to observe the track and other roadway structures. With his other responsibilities, he should not be burdened with the actual operation of the motor car.

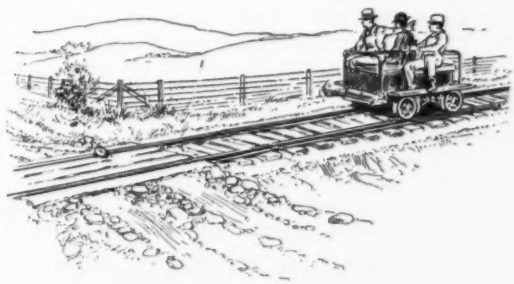
Cars Must Be Kept Clean

Each foreman or other man to whom a motor car is assigned should be charged with the duty of keeping his car thoroughly clean and properly adjusted, and he should make such light repairs as he can conveniently handle. When repairs are needed that he cannot handle, prompt report should be made to the proper authority. The only way to keep a car in good condition is to make regular and methodical inspections. At the close of each day's work the fuel and oil supply should be replenished if necessary and an inspection made of brakes, wheels and other vital points before the car is put away, in order that it may be available for service at any time upon short notice. In addition, the car should be cleaned and a more thorough inspection made weekly and, to insure regularity, on the same day each week.

Each foreman and others to whom motor cars are assigned must have a standard watch, comply with the current watch inspection rules, and take advantage of all opportunities to see that his time is always correct. He should know the time of all scheduled trains and should teach his men to assist him by keeping train movements in mind in order to make doubly sure that none is overlooked.

Train Lineups Are Helpful

Where means are available, a lineup of train movements should always be secured before taking a motor car out on main track. This should not be in the form of verbal advice but should be in writing, direct from the dispatcher. It should be made clear, however, to motor car operators that such lineups



Be Alert at all Times and Have Car Under Control on Approach to Crossings

are furnished only as information and will not relieve them from the responsibility of protecting against accident. They should bear in mind that operating conditions may require reversing a train movement or running an additional train at any time. They should watch closely for signals carried by trains to know if other sections are following. Where cars travel considerable distances, as in inspection service, lineups should, when possible, be renewed at frequent intervals, and often enough to insure complete knowledge of train movements.

Where no lineup is available, as is often the case with section forces, or when an existing lineup is no longer entirely dependable, motor cars must be operated with extreme caution, and where there is not a clear view in each direction for a sufficient distance to permit readily clearing an approaching train, flagging protection must be provided. To do otherwise is to invite a serious accident. Motor cars should be in the clear well in advance of the time a train is due at a given point. Never should less than five minutes be allowed.

Speed Must Be Controlled

Motor car operators should be cautioned that they may at any time meet a motor car traveling at a speed at least as high as their own, and they must at all times be able to stop in not to exceed one-third of the length of their clear view of the track ahead. The operator and, where there are several men on the car, another man should watch closely for obstructions on the rails; and also, where the car is occupied by two or more men, one should be delegated to face the rear and keep a lookout behind.

Excessive speed is probably responsible for more of the severe, as well as the fatal, motor car accidents than any other one cause. By excessive speed is meant an unsafe speed, whether it be in excess of the maximum allowed by the rules or only a failure to have the car under complete control at a highway crossing. The rules issued to motor car operators

should define as clearly as possible the maximum allowable speeds under various conditions and the necessary steps should be taken to see that they are observed by all classes of employees.

The maximum safe speed for motor cars may differ on various roads or on various parts of one road, but generally speaking, a maximum speed of not to exceed 25 miles per hour should be designated for light types of inspection cars and certain gang cars when in inspection service and without tools, such classes of cars to be clearly specified. If certain types of heavy inspection or other cars are permitted to attain a higher speed these should first be equipped with safety bars and should be clearly distinguished in the rules from the others. Section and extra gang cars should be restricted to a speed of not to exceed 20 miles per hour. No car should exceed 8 miles per hour past stations, through yards, interlocking plants, or over switches or railroad or other grade crossings. It should be impressed upon all motor car operators through education and, if necessary, discipline that designated speeds are permitted only on straight track when the view is unobstructed and other conditions are favorable. On curves or under unfavorable conditions of any kind the speed must be further restricted to a point where absolute safety is insured.

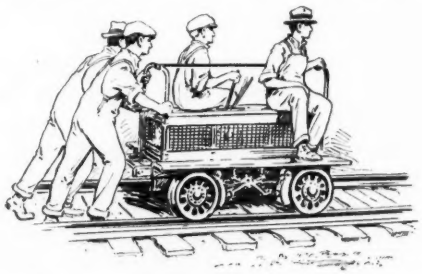
Care Approaching Highway Crossings

In approaching highway or other grade crossings all motor cars should be slowed down until they are under complete control and, if the view is not entirely unobstructed, they should be stopped and the crossing flagged. Those in charge of motor cars should

What's Wrong Here?
The car is out of date and so is the manner of its use. How many safety rules are being violated?

be made to understand thoroughly that they will be held accountable for accidents of any nature on highway crossings in which their cars are involved. Vehicles approaching on the highway should be signaled to cross first. Where crossings are protected by watchman, cars should not proceed until signaled by the watchman. Cars should not be run past trains discharging passengers, and should be run only with extreme caution past groups of workmen, passengers or others on or about the tracks. On at least one road with a very good safety performance, the occupants are required to stop the car, dismount and stand in the clear during the passing of a train on a track adjacent to that on which a motor car is being operated.

Motor cars should be used only in company service and none but employees on duty allowed to ride on them. They should be used only for transporting men and tools and light equipment or material. If heavy material is to be handled it should be loaded on a trailer and be pulled behind, never pushed ahead. Heavily loaded cars that cannot be quickly removed from the track should always be protected in accordance with the flagging rules when on a main track. The load should be symmetrically placed on a car and well secured. Men regularly riding a motor car should habitually occupy a specifically designated seat and should not be crowded. If there are more



To Start, Push from Behind and Mount from the Rear of the Car

than a motor car will carry, the remainder should be handled on trailers specially fitted with seats and handrails for this purpose. Accidents are sure to occur sooner or later if groups of men are permitted to ride ordinary push cars behind motor cars. It is important that trailers or push cars pulled behind motor cars be well designed and ruggedly built and, above all, that a safe coupling be used. There are excellent couplers on the market, some equipped with springs to absorb the shock, or they can be easily made. The essential features are that they have ample strength without slack, can be easily coupled and uncoupled and yet cannot come uncoupled on the road.

Men should be taught the proper method of retarding the spark and cranking free running engines to avoid injury. Engines should be stopped before cars are removed from track and should not be left running, except for short intervals, while cars are standing still. Undue idling of an engine is detrimental to its operation. Racing an engine, especially when cold, may cause permanent injury to the engine and failure at an embarrassing time.

Jumping off of moving motor cars or mounting them from the side or front when moving, especially when the speed is slow, often seem to be simple matters, but they are the cause of frequent and often severe injuries and should not be tolerated. Cars should always be started and stopped gradually. Men on the car should have warning before brakes are applied, and if other cars are following they should be given a stop signal, which should be acknowledged by them before the speed of the preceding car is materially reduced.

Miscellaneous Precautions

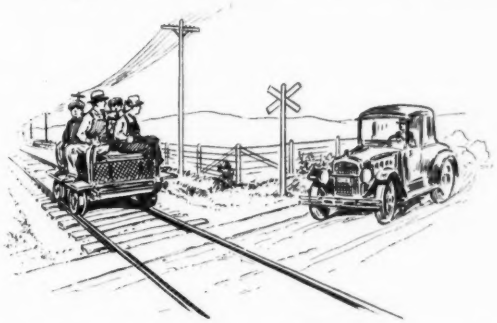
There is often a temptation to leave a car on the track while attending to some small job. This is poor practice and should be prohibited, as time may pass more rapidly than is realized or the attention of the operator may be forcibly drawn elsewhere and a train or other car may easily approach unnoticed.

In placing a car on or off of the track, each man should be regularly assigned to a certain duty. Two men properly drilled will often handle a car more

quickly and much more safely than half a dozen in a hurry and not properly drilled. The wheels should be lifted out of flangeways before the car is turned, lest they be twisted. If cars are not handled carefully, axles may be bent or the car may be damaged in striking the rails.

Insofar as possible, cars should always be set off of the track at places provided for that purpose. If necessary to set them off on road crossings they should be removed as soon as possible and highway traffic protected while they are there.

The minimum spacing between motor cars and other track cars while running and the minimum distance behind trains should be clearly defined and rigidly observed. Ordinarily when moving, the distance between motor cars and other motor or track cars or the distance behind trains should not be less than 600 ft., and motor cars should not approach closer than 200 ft. behind standing trains. For some roads it may be advisable to increase these distances.



Stop Your Car and Signal the Auto Driver to Come Across

Motor cars should not be operated after dark if it can be avoided, but when it is necessary to do so they should be equipped with a white light in front and a red light at the rear. If night operation is often necessary, the car should be equipped with a reliable head light and a tail lamp.

Motor cars should always carry a full complement of flagging equipment, and, since flagging may unexpectedly become necessary at any time, the men with motor cars must thoroughly understand the current flaaging rules. Torpedoes exploded should be promptly replaced.

Underground tanks, equipped with pumps and locks, should be provided for the storage of gasoline to avoid the hazard that is always present when drums of gasoline are stored in tool houses.

As has been pointed out, proper care and maintenance of motor cars are essential to their safe operation. Accidents will certainly be reduced if the cars are always in condition to make the required trips without delay and without the necessity of making adjustments on the road. Further reduction may be accomplished if unnecessary use of motor cars is avoided, and the work so planned as to hold their normal use to a minimum.

All of the points that have been mentioned, and often others, should be clearly covered in printed instructions furnished to every motor car operator, including both the foreman and the man delegated to operate his car; but merely to formulate and distribute an excellent set of rules is of little benefit unless the matter is followed up and the rules uniformly and rigidly enforced, with co-operation and friendly advice from the supervisory forces.

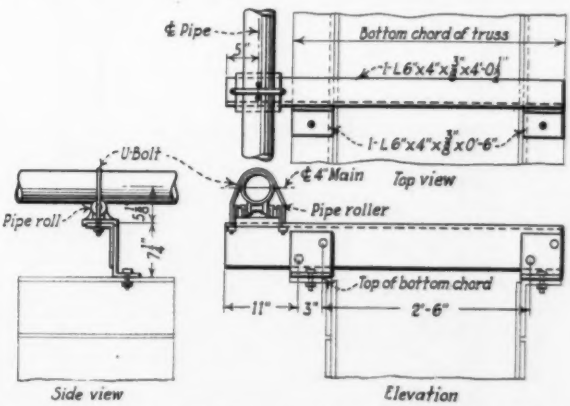
Protects Large Bridge Against Fire Hazard

By J. B. Hunley

Engineer of Bridges and Structures, Cleveland, Cincinnati, Chicago & St. Louis, Cincinnati, Ohio

TO REDUCE to a minimum the fire hazard on the new steel truss bridge of the Cleveland, Cincinnati, Chicago & St. Louis over the Ohio river at Louisville, Ky., the superstructure has been provided with a dry fire line. The deck of the bridge is built of creosoted material and, while no serious fires occurred on the old bridge during the last 15 years of its life, it was thought that the additional cost for the protection was warranted by the large investment, and the serious interruption to traffic which might occur from a bad deck fire.

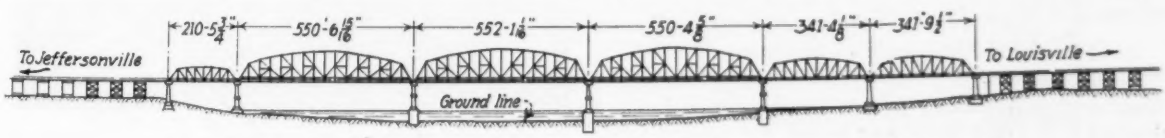
The river crossing alone is one-half mile in length and is about 80 ft. above the water, while the approaches are 1½ miles long and about 65 ft. high at certain points, making it impossible to fight a serious



Showing the Method of Supporting the Fire Line Along the Bottom Chords of the Bridge Spans

fire from below. The dry fire line is equipped with risers at points convenient to fire hydrants in Louisville and Jeffersonville, which is across the river, and with hose outlets at the level of the tracks.

In Louisville the fire line commences on the southern approach, about 1,500 ft. from the end of the bridge, and is carried underground 1,250 ft. to Fulton street, where it rises to the deck of the viaduct, the riser being provided with a siamese connection for a fire engine. From this point, it passes over the bridge and along the superstructure of the Jeffersonville approach for about 100 ft. to Front street, where it



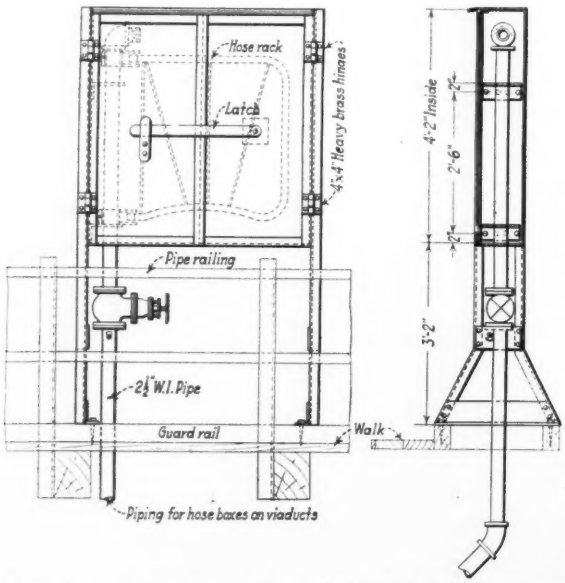
A Deck Fire on the Main Spans of the Bridge Would Be Difficult to Control from Below

drops down through a siamese connection and continues underground for a distance of 2,300 ft. to Sixth street, where it again rises through a siamese connection to the deck of the viaduct. From this point, it extends about 500 ft. farther to a point where the viaduct is low enough to be protected from the ground.

Wind Was Considered

The underground lines are all of Class D, 4-in. cast iron pipe, with 2½-in. risers. The overhead line and main risers are 4-in. standard-weight, wrought iron pipe with screwed and flanged fittings. On the viaducts, the exposed main is supported on the side of the girders below the deck, while on the river spans it is carried along the outside of the trusses several feet above the rail. The line is located on the west side of the structure, as the prevailing winds are from that direction and the danger of the hose outlets becoming inaccessible in case of fire is less.

That part of the line which is carried on the superstructure is supported in roller chairs with straps, and is provided with swing expansion joints at the end of each of the river spans, and at other points where needed. These swing joints consist of six



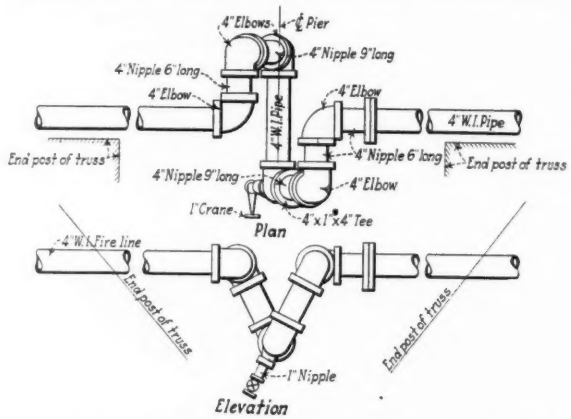
Elevation and Section of One of the Metal Hose Boxes

elbows and nipples, and are arranged so that the line can be drained at the low points by means of gate valves. The hose outlet risers are taken off from the under side of the main with a swing joint, and are drained with valves. These outlets are spaced about 300 ft. apart and terminate in metal hose boxes, each of which contains 100 ft. of fire hose, which is supported on a swinging rack. The risers, which end in elbow and hose connections, pass up into the hose boxes, which are rigidly supported on the structure. Pet cocks for air relief are tapped into each riser, and similar vents are provided at other high points in the system.

Line Filled in Five Minutes

In the underground line, valves and sewer connections are arranged so that the entire system can be drained to a point three feet below the ground line, it being the intention to prevent damage by freezing and to keep the line drained, except when it is in use or during the periodical tests. Water can be delivered to the line by pumpers from either or both of the Louisville and Jeffersonville fire departments. Since it takes less than five minutes to fill the entire line, using only one engine, no valves were placed in the main except near the ground at the siamese connections, which are under the supervision of the fire departments, as any valve in the main might possibly be at the very center of a fire, and, hence, be inoperative.

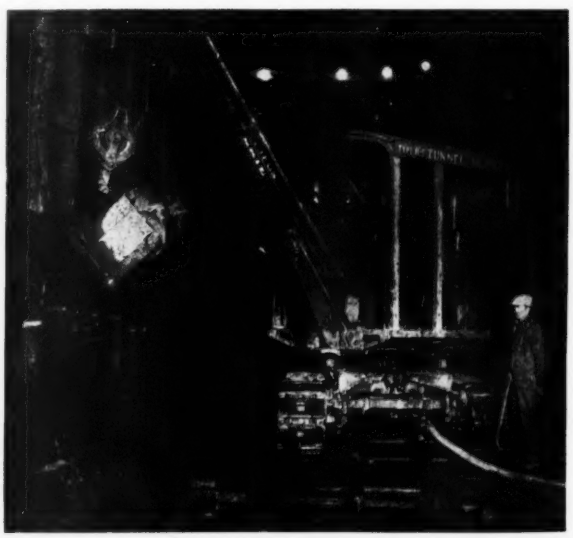
There is an interlocking tower at the south end of the bridge, from which a fire on nearly any part of the structure is visible, and from which an alarm can



These Swing Expansion Joints Were Placed at the Ends of Each River Span and at Other Points Where Needed

be sent. The intention, however, is to place call boxes on the remote portions of the structure in Jeffersonville, from which the watchman can send the alarm. Ladders are provided on the viaducts, at the pumper connections, so that the firemen will have easy access from the ground to the deck.

In addition to the fire line, the usual water barrels and buckets are provided, so that any small fire can be cared for without undue expense. The cost of the completed installation was about $30,000.



Air-Operated Mucking Shovel in the Hagans Tunnel on the Louisville & Nashville

Cutting a Train Shed to Fit New Cars

Lackawanna trims off 16,800 ft. of concrete smoke duct aprons at its Hoboken terminal, saving large amount over lowering tracks or raising structure

THE BRIDGE and building forces of the Delaware, Lackawanna & Western were recently confronted with an unusual problem, which caused considerable concern at first, but which was ultimately worked out in a most effective way and at a cost not exceeding one-fourth of what it was expected would be necessary to secure the result desired. The problem presented was that of providing an increased vertical clearance of about ten inches in the extensive Bush-type train shed of the road at its passenger terminal at Hoboken, N. J., to permit the operation of multiple-unit trains, with overhead contact, incident to the electrification of its New York suburban lines, now well under way.

In a study of this problem, consideration was given first to what appeared to be the only practical methods of doing the work—depressing the tracks or raising the shed. It was finally decided, however, to secure the increased clearance by cutting off the low projecting aprons of the smoke ducts. This was done in a most effective manner, at a relatively small cost compared with what the other methods of doing the work would have cost, and the results secured were satisfactory in every way.

Shed Covers Large Area

The Bush-type shed at the Hoboken terminal is 600 ft. long by 340 ft. wide and covers 14 tracks and nine 22-ft. low concrete platforms. This shed, which was built in 1906, has a structural steel roof frame consisting essentially of a series of multiple arch steel girders, spaced 27 ft. apart. The individual arched girders have spans of 44 ft. and extend from the center of one platform, over two intermediate tracks to the center of the next platform. The roof deck is of concrete slab construction with skylights over the platforms and longitudinal smoke ducts over each track. This entire roof structure is carried on ornamental cast iron columns, which are supported on concrete pedestals resting on piles. The roof

Beneath the Train Shed, Showing the Smoke Duct Aprons Before They Were Cut Off

columns are laid out in nine longitudinal rows through the centers of the platforms, there being 27 columns in each row.

To lower the tracks at the terminal would not only have been costly, but was impractical inasmuch as the entire terminal is carried on piling or on made ground, with the present top of rail only about seven feet above mean tide level. This method would also have necessitated the reconstruction of the platforms, either lowering them to bring them to the proper height for low platforms, or raising them to car floor height.

While the raising of the shed was not an impossibility, it was recognized as a costly solution, and one which would have presented serious difficulties, in addition to interfering with the movement of the more than 200 trains and 30,000 people who use the terminal daily. To have raised the shed would have necessitated lifting it in three sections, since it is constructed in three distinct units, separated by expansion joints at the third points in its length.

Duct Aprons Are Cut Off

In view of the excessive cost and impracticability of lowering the tracks or of raising the shed, consideration was given to an idea advanced for cutting off the projecting concrete aprons of the smoke ducts an amount sufficient to provide the increased clearance required. Examination of old construction plans showed this to be entirely feasible and, furthermore, that owing to the peculiar construction of the ducts, the problem presented was not as difficult as might be expected from an inspection of the ducts themselves. In this construction, the smoke ducts consist of two vertical concrete slabs, 4½ in. thick by 4 ft. 4 in. deep, each reinforced with wire mesh and light lattice steel trusses extending between girders. The reinforcing trusses are made up of two 3-in. by 2-in. by ½-in. angles, 2¼-in. by 5/16-in. lattice and ⅜-in. gusset plates, and have riveted connections at each end with the web plates of the girders. The depth of the reinforcing trusses in the two aprons of the ducts differs, that of the trusses on the low side of the arch in each case being 2 ft. 6 in. overall, while the trusses nearest the crown of the arched girders have an overall depth of 2 ft. 9 in. In spite of this and the curve of the roof girders themselves, the bottom chord angles of the reinforcing trusses are, in each case, about two inches above the lower cover plates of the girders directly at the point of attachment. Below this point the aprons of the ducts were reinforced only with wire mesh, the mesh being a continuation of that wrapped around the trusses.

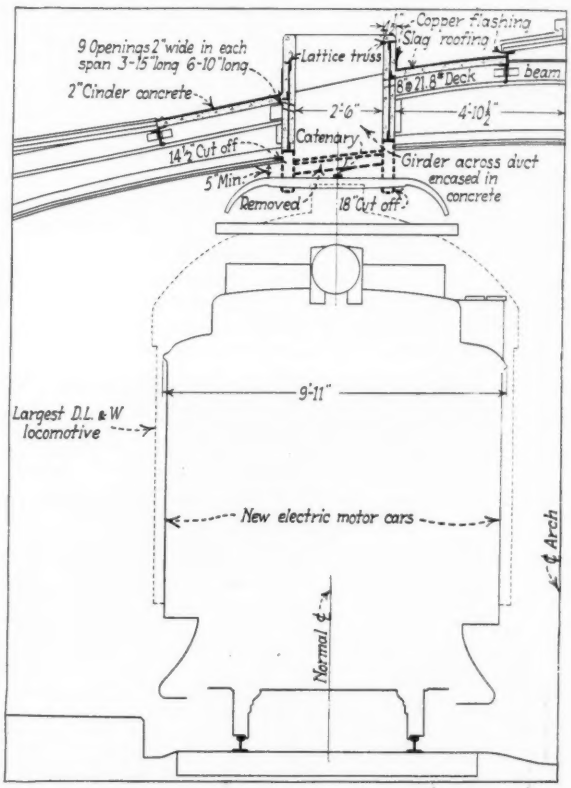
In deciding to secure the increased clearance desired by cutting off the aprons, cuts were made flush with the lower chords of the reinforcing trusses, and while this shortened the aprons a couple of inches more than was necessary, it resulted in considerable less cutting through the concrete than would have been necessary if the cuts had been made flush with the bottom plates of the girders, or lower. The actual cut-off from the aprons on the sides toward the crown of the arches was 18 in., and from the aprons on the low sides of the different arches, 14½ in.

In carrying out the work, the bridge and building force were given the use of one track at a time and worked day and night in two 10-hr. shifts. All of the work was carried out from specially constructed scaffolds supported on the station platforms and capable of being taken down or erected easily, and from scaffolds constructed on gondola cars.

Cutting off the aprons was done with specially designed drill hammers which employed four-point rotating drills. These drills had an air passage through the core, through which compressed air was fed to keep the cuts clean. The entire drill assemblies weighed only about 60 lb. each.

Air for the operation of the drills was furnished by the terminal power plant through a temporary two-inch pipe line laid across the top of the shed at its mid point, which was provided with take-offs near each smoke duct, from which one-inch laterals were extended each way to the ends of the shed. These laterals were, in turn, fitted with take-offs at each bent for convenient connection of the ¾-in. hose leads to the air drills.

In order to insure straight cuts and, at the same time, afford supports for the drills while cutting, lines of 1¼-in. by 6-in. planks were bolted along both faces of the apron being cut, with the top edges of the planks, in each case, a distance below the line of



Part Cross-Section of the Train Shed Construction, Showing How the New Cars Interfered with the Aprons

finished cut, equal to the diameter of the drill points. Holes through the aprons for the bolts were made with the drills and were spaced about four feet apart.

Cutting Done by Channeling

Making the cuts was done with more of a channeling action than one of drilling. In this work the drills were held in a horizontal position and were moved back and forth on the plank guides, forming a groove of uniform depth. This grooving was done simultaneously on both sides of the apron, the total depth of groove necessary on each side, to the lower chord angle of the apron reinforcing truss, being about 1½ in. When cut through, the guide planks were removed and the reinforcing mesh, which still

held the lower section of the apron in place, was cut with hand chisels. This latter work was done from scaffolds built on gondola cars, so that the sections of the apron removed could be lowered or dropped directly into the car for disposal. All of the concrete cuts were made clean and true, and, therefore, the only finishing work required was to paint the newly exposed steel in the aprons.

One of the interesting features of the work was the speed with which it was carried out. This was due largely to the organization and method of procedure adopted, which made it possible to keep each operation progressing uniformly ahead of following operations. Altogether, the 14 ducts at the terminal, or 16,800 ft. of aprons, were cut off in 25 days of practically continuous operation, with an average day force of 37 men and an average night force of 20 men. This was at the rate of about 670 ft. of apron a day on the job as a whole. In the case of one duct, over a track which is used for almost continuous switching operations, and which, therefore, could be given up only part time on Sundays, both aprons throughout their full length of 600 ft., were cut off in 18 working hours.

Work on this duct was done with an enlarged force and was carried out from scaffolds erected on a train of nine gondola cars. By making the scaffolds portable in this way, all preliminary work in arranging the scaffolds was done without interrupting the use of the track, and the track was cleared immediately upon completion of the work by pulling out the scaffold train. Mounting the scaffolds on cars was particularly effective in handling the work on this track because it precluded the necessity of moving them frequently as the work progressed and also because at one time while the work was under way, it was necessary to free the track for switching operations for a period of several hours.

The entire work, which was done at a total cost of about $13,000, was carried out under the general direction of George J. Ray, chief engineer, and M. H. Doughty, division engineer. The actual work was done under the supervision of W. H. Speirs, assistant engineer, and was in direct charge of Isaiah Marshall, division bridge and building foreman.

Power Drills Save Money on the Illinois Central

POWER-driven drills of various types are coming into extensive use, not only by reason of their economy and the time saved but also for the reason that they take the drudgery out of hand drilling. This is particularly true of track work.

Power track drills are used both for drilling holes for bonding wires and for bolts and track fastenings. Air and electricity are used to some extent in the operation of these tools, although the majority of them are self-contained units which are driven by gasoline engines. Twenty-three gasoline-powered bonding drills and four power track drills are now in use on the Illinois Central. There are also a number of air and electric-driven, portable drills, which are used at points where air or electricity is available.

The New Orleans Terminal division of the I. C. has produced some interesting figures in regard to the comparative cost of hand and power drilling in connection with track work in Harahan yard, New Orleans, La. A total of 979 holes $1\frac{1}{16}$ in. in diameter were drilled in 90-lb. rail for the purpose of applying heel fillers. The machine used was a portable rail drill, which was driven by a gasoline engine. Excellent results were obtained, both in the time saved and the cost of drilling. Actual tests, between power and hand drills, showed that the power machine can drill a 1 1/16-in. hole through the web of a 90-lb. rail in 30 sec., while 12 min. is required with the hand power drill. Holes are not drilled this quickly in actual operation on account of the time required to move and set the drill and to follow

A Power Drill in Use

up with the work of placing the bolts. The records indicate, however, that hand drilling requires 8 hr. to drill 20 holes in ordinary work while the power drill will drill 20 holes an hour in track. Two men are required to operate the hand drill, while one man can operate the power drill, except when it is necessary to remove the drill from the track, which can be done by two men, although three are usually employed when working on main line track. The power machine is not only more effective in actual drilling, but shows greater economy in the number of drills used. An interesting detail in the operation of power drills on the New Orleans Terminal division was the number of holes drilled with one bit, reports showing that 384 holes were drilled with one high-speed bit without regrinding.

Another example of the efficiency of power drilling arose in connection with the installation of a platform at the icehouse at Bluford, Ill. This work required a total of 800 holes, which were bored at the average rate of 11 per hour and at a cost of 5 cents per hole, as compared to 42 cents for holes bored by hand. The division officers estimate that the average saving per hole at Bluford was 37 cents, or a total saving on the job of $296.

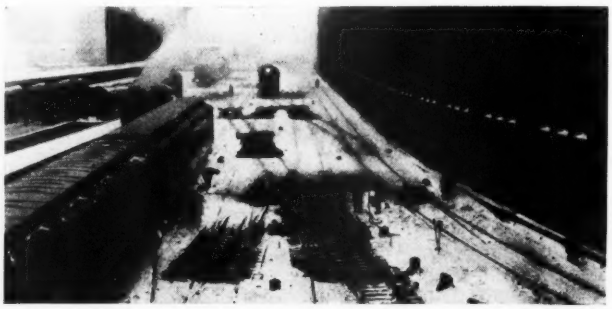
The time saved in drilling with power bonding drills is an important factor, particularly when laying rail, as modern power tools, such as adzing machines, rail layers, track drills and power-driven wrenches have speeded up the work of rail laying to such an extent that it is difficult to keep up with the work of bonding the rails without power drills. There are many uses for power drills in the maintenance of a railroad, and their economy has been amply demonstrated. Regardless of how effective the machine may be, it must be used in order to realize on the investment. It is evident from results secured on the New Orleans Terminal and the St. Louis divisions that the possibilities of these useful tools are fully realized and that the division officers are showing the desired return on the investment. We are indebted to C. R. Knowles, of the Illinois Central, for this information.

Fighting the Blizzards
at the Chicago Union Station

Two storms of unusual intensity handled without serious delay to train service*

By C. E. COX

Chief Engineer, Chicago Union Station



Snow-Melting Equipment Kept the Switches Clear

DURING the two severe blizzards which struck Chicago during the past winter, one in December and the other in March, the Chicago Union Station was able to provide for all train movements without interruption and with practically no delay. Such delays as did occur to trains were usually the result of conditions beyond the limits of the Union Station tracks.

This record was made in the face of the fact that the station layout comprises more than 12 miles of intensively used tracks, the number of train movements being approximately 1,600 in 24 hours, in which there are 47 double slip switches and 58 turnouts, all of which are interlocked and controlled from two interlocking towers; and despite the further fact that the first storm, which was accompanied by a high wind that caused the snow to drift badly, and a temperature which fell to around 18 deg. to 20 deg., made an all-time record for snowfall for a single storm in Chicago, 14.2 inches of snow having fallen during the three days the storm was in progress. The second storm, which was of equal duration, was worse in some respects. Although the temperature was higher, varying only a few degrees from freezing, the snow drifted as badly as during the first storm, but was wet and packed solidly in the drifts, while the total fall of snow exceeded 19 in., thus breaking the record made by the earlier storm. During both of the storms, practically every form of local transportation in Chicago was completely paralyzed, except the railways and the elevated lines, and these were seriously handicapped.

The Chicago Union Station is a double stub-end terminal, 10 station tracks used by the Chicago, Milwaukee, St. Paul & Pacific being at the north end, while 14 tracks on the south serve the Pennsylvania, the Chicago, Burlington & Quincy and the Chicago & Alton. The train movements are divided between 400 at the north and 1,200 at the south end, while 8 of the double slips and 24 of the turnouts are north of the station, and 39 double slips and 34 turnouts are in the south station and approach tracks. Because of the limited space available for tracks, the track centers are not wider than 13 ft., except at the points where they join the tracks of the constituent companies or spread out to enter the train sheds.

The regular maintenance organization is rather small, consisting of 2 track foremen and 16 laborers and 1 signal foreman and 14 maintainers, the latter force being divided into three eight-hour shifts. This organization is under the general supervision of a supervisor of track and a supervisor of signals who are employed jointly by the station company and one of the constituent railways. It is under the immediate supervision of an assistant supervisor of tracks and signals, whose duties are confined to the station property. Since this force is too small to be effective in combating even ordinary snow storms, it became necessary to arrange for augmenting it whenever the snowfall reaches a certain magnitude. As this is the entire maintenance force, there is no surplus labor to draw on and, since it is extremely dangerous to depend on outside help that is not familiar with the track layout, the train schedules and the methods of operation, the regular force is supplemented by the addition of red caps from the station and men from the mail-handling department. In the main, the red caps are undergraduates who are working their way through college and are, therefore, intelligent and physically fit. The mail-handlers are older men, but are seasoned by outdoor work. Both classes, however, are thoroughly familiar with train schedules and methods of operation.

The emergency organization consists of the supervisory force outlined above, although as a rule the assistant supervisor is in responsible charge. He is assisted by the signal maintainers, who are assigned to strategic points throughout the terminal, while the two track foremen regularly assigned to the north and south ends of the station layout, respectively, have direct charge of the trackmen and the red caps and mail-handlers who man the torches which are used for snow melting. Whenever it is necessary to use inexperienced laborers they are assigned to sweep or shovel snow. During the fall, when the program for storm fighting is thoroughly reviewed, this organization is schooled in the duties of snow fighting, and the work that is to be done is rehearsed, so that every man, except the casual laborers who must be drawn on occasionally, is thoroughly familiar with his assignment.

The program includes the listing of every man who is to be called out, the sequence in which they

*Abstracted from a paper read before the Maintenance of Way Club of Chicago, April 16, 1930.

are to be called, the particular function every man is to perform and his home address and phone number. If the storm begins or develops in intensity after the men are relieved from their regular day's work, taxicabs are sent to their homes for them to insure their reporting at the earliest possible moment. Since most of the red caps and mail-handlers do not possess clothing to withstand the rigors of the storm and cannot be expected, in any case, to wear their regular uniforms or suits, which would be quickly ruined, they are equipped with clothing suitable for the duties they are to perform. They are called in the following sequence: The trackmen, the maintainers, the red caps and the mail-handers. Casual labor is employed only when necessary to dispose of an accumulation of snow.

Snow Fighting Equipment

The snow fighting equipment consists, first, of the usual complement of brooms and shovels. Because of the large number of switches involved, however, and the frequency of their operation, this equipment is wholly inadequate for other than the lightest snowfall. For this reason, various types of snow-melting equipment have been installed, including steam pipes, portable torches, snow-melting pots and fixed gas burners. Owing to the complexity of the track layout and the overhead conditions which make the installation of feeder circuits difficult, electric snow-melters have not been tried.

So far, steam thawing has been confined to two slip switches and one turnout near the power house. At these swiches, 1¼-in. pipe coils have been placed parallel to the ties, one coil in each tie space, graded so as to provide drainage for all condensation occurring at any point in the line. This arrangement made it necessary to lower the drainage side of the line about six inches below the base of rail, which somewhat impaired its usefulness, as only the radiated heat is available for melting the snow which accumulates around the switch points. The installation has worked satisfactorily for temperatures higher than 18 deg., but does not keep the switches clear at lower temperatures. No effort is made to reclaim the condensation, which is bled out through a trap and drained to a sewer.

Small open-top, oil-burning pots with a capacity of one quart of oil have been used in the past, but since about 50 of these pots are required for a slip switch, and since the particular type which was in service must be filled at frequent intervals—about once every hour—they have not been satisfactory for the conditions which must be met in this terminal. Furthermore, the open-top type which was used showed a tendency to flare up momentarily, throwing a flame several feet high when the oil in the reservoirs had been used down to a certain point.

Gas Snow Melters

During the summer of 1929, four double-slip switches near the throat of the south approach were equipped with stationary heaters designed to use commercial gas as fuel. The type of heater installed is similar to those which have been in use at the Washington, D. C., terminal for several years. The equipment for a No. 8 double slip switch consists of 47 units, each of which has two burners, so arranged that the first series of burners are placed in the tie space immediately ahead of the switch point and in each succeedinig space to and including the heel of the point, except that four spaces ahead of the heel are omitted. The burners are fastened to the rail with spring clamps, and because of the wave action of the rail under traffic it is necessary to use a flexible connection between them and the fixed supply pipe.

During the period of greatest intensity of the storm, 15 cu. ft. of gas was used per hour by each burner. During the major part of the time, however, about 12 cu. ft. per burner, or 1,200 cu. ft. per hour at a slip switch, was consumed. At this rate of consumption, all of the snow was melted between the rails and for a space of 18 in. outside. As the storm abated, this consumption was reduced to 1,000 cu. ft. per double slip. This melted the snow for about 12 in. outside of the rail, but left a strip of unmelted snow about 6 in. wide between the rails. In each case, the rail was dry and too warm to be comfortable to the touch. When the flame was throttled still further, however, the heat was insufficient to keep the rail dry, and very little melting occurred except on the rail itself.

This installation was operated for a total of 184 hr., consuming 734,300 cu. ft. of gas during this period. The average cost for the 184 hours of operation was 76 cents per hour per slip switch. Owing to the fact that the temperature was higher during the second storm and also because the forces were more familiar with the operation of the burners, the cost was reduced materially.

The remainder of the layout was kept clear of snow by means of large suction-type, self-generating oil torches, 24 of which were used. Three buried oil-storage tanks are located in the terminal, two of 1,200 gal. capacity on either side of the south interlocking tower and one of 1,500 gal. capacity north of the north tower. A main distributing line, 1½ in. in diameter, extends from each tank, and ¾-in. branches lead to the individual slips and turnouts. The oil is forced to the outlets by means of air pressure taken from the 90-lb. operating lines of the interlocking plant and applied to the tanks at 8 lb. through reducing valves, each tank being protected against possible extreme fluctuations in pressure by safety valves set at 15 lb.

The oil outlets are located near the air outlets for operating the electro-pneumatic functions at the switches, so that the air and oil hose for operating the torches can be taped together for convenience. This also reduces the length of hose to about 20 ft. Each oil and air outlet is equipped with quick connectors to enable the operator to move from one switch to another with a minimum of delay. The air for the torches is taken from the 90-lb. line without reduction, and the torches are capable of throwing a heavy, practically smokeless flame to a maximum distance of 15 ft., although the normal length varies from 5 ft. to 10 ft., which is sufficient to permit the operator to stand clear of passing trains. During these storms, one torch in constant operation was sufficient to keep three double slip switches open and clear of snow. The torch nozzles are of pipe and are about five feet long. The oil that gave the most satisfactory results was the grade known as standard furnace oil.

One of the important factors, if not the principal one, in the successful fight that was waged in both storms was the ability to get the organization in the field at the beginning of the storm, before conditions became critical. Another factor was the use of men who were thoroughly familiar with operating conditions and had been schooled in their duties before the emergency occurred.

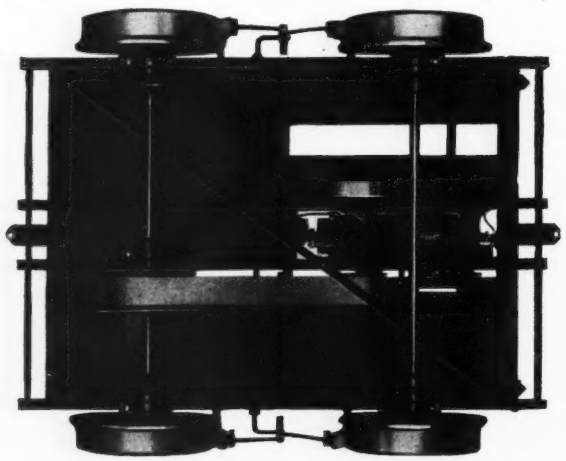
How a Motor Car is Built

*A discussion of the variations in construction practices of different builders**†*

By C. R. KNOWLES‡

ROADWAY motor cars do not differ greatly in appearance, as they follow the same general lines in the frame, deck and running gear, except in special inspection cars and certain types of self-propelled power cars designed to operate such special tools and devices as power track jacks, ballast discers, track oilers, tie adzing and scoring machines, and similar equipment. There is a wide variation, however, in methods of construction and materials used, as, for example, between wood and steel frames and even between different frames of both wood and steel. The same thing applies to the running gear. The wheels, axles and axle boxes are very similar in general appearance on all cars, the most marked difference being in the size of the wheels of different cars. There are differences in design and construction, however, that do not readily catch the eye, as, for example, in the design of wheels or in the type of axle boxes, while the character of the steel used in axles differs with each manufacturer and frequently with different cars of the same make, the decks of motor cars also differ in the arrangement of seats and tool space. There is, of course, a wide difference in the kind and type of power plant used on different cars, as well as in the method of transmitting the power to the axle of the car.

Several hundred different parts enter into the construction of a motor car, ranging from a tiny spring or screw weighing a fraction of an ounce to the cylinder or frame that may weigh a hundred pounds or more. It is obviously impossible to discuss all of these many parts in an article such as this; rather it is necessary to restrict the discussion to the more important parts of the car with which the operator is brought into more direct contact and to attempt to describe their functions and their relation to the operation of the car.



A Casey-Jones Composite Steel and Wood Motor Car Frame

* This is the fourth of a series of 12 or more articles on the Care and Operation of motor cars, the first of which, on the Place of the Motor Car in Railway Work, appeared in the January issue, page 5, the second, on the Type of Motor Car, in the February issue, page 54, and the third, on the Motor Car Engine, in the April issue, page 158.

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The Frame

The frame of a motor car is that portion corresponding to the frame of an automobile. It rests upon the axles and supports the deck, platform and engine. It may be constructed of either wood or steel or a combination of the two.

The frame construction of the earlier types of motor cars was of wood exclusively, and these frames followed closely the design used on hand and push cars, with added supports for the engine. Although the general tendency now seems to be towards steel, wooden frames are still used extensively. Aluminum alloys are also used instead of steel on some types of cars. A well-designed wooden frame consists of two side and two center longitudinal sills and from four to six cross sills, with diagonal braces extending the full length of the car from the outside corners of the rear end of the frame to the center sills at the opposite end, and two short diagonal strut braces extending from the front corners of the frame and intersecting the longer braces about 30 in. from the rear. This or a similar design of frame is used extensively on cars with belt drive. Wooden frames are usually constructed of oak, elm or maple.

A Sheffield All-Steel Motor Car Frame

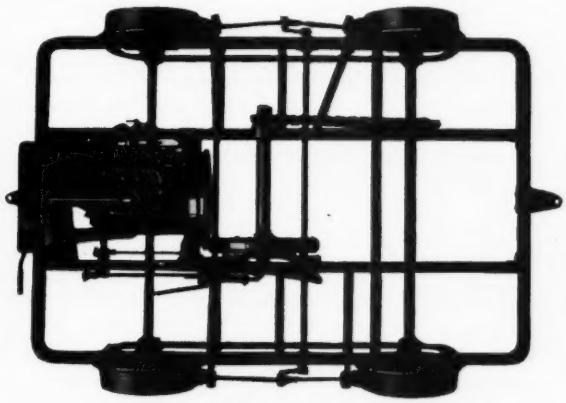
Steel frames are constructed either of pressed steel shapes similar to the sills of automobile chassis or of angles or other steel shapes riveted or bolted together, the general design being similar to that of the wood frame except that the bracing effect is accomplished by corner plates instead of diagonal braces. Steel frame construction is desirable for certain types of section and other cars where additional strength is desired and the additional weight over wood is not important. The use of a wooden frame offers a combination of strength and light weight. It also has the advantage

that a new sill can be readily made and installed by any good carpenter.

While wooden frames and light construction have their advantages, they have their disadvantages, as well, for they become loose and get out of alinement more readily than heavier steel frames. Bolts are also more liable to become loose in wooden frames than in steel, and bolt holes are more likely to become enlarged. Wood also has a tendency to swell and shrink under varying weather conditions, which fact increases the possibility of loose bolts.

Safety Railing

Safety railing is practically standard equipment with all cars. It usually consists of a front guard of pipe extending from or near the outside front corners of the platform up over the deck or seat, being either bent to shape or formed with pipe fittings. A similar guard is placed on the back end of the car and the two are sometimes connected by a center rail. The rear guard is in most cases only as wide as the deck or seat to permit men to board the car more readily when it is in motion. The railing is constructed of

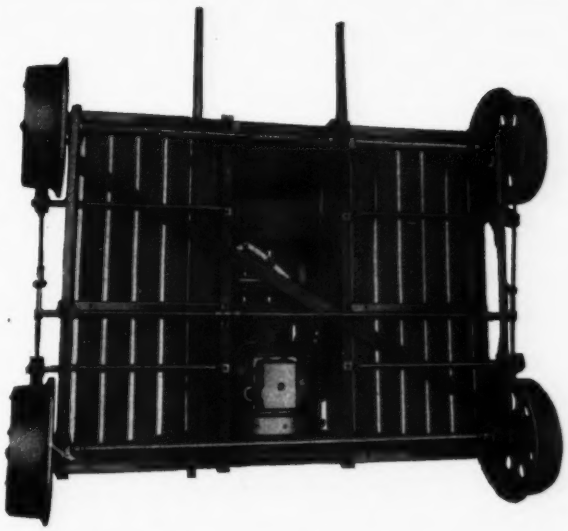


A Kalamazoo All-Steel Motor Car Frame

one-inch pipe and extends from 12 in. to 18 in. above the seat at the front and from 6 to 10 in. at the rear. In some cases, the railing is only as wide as the seat in both front and rear, but standard practice is to extend the front railing approximately the full width of the car. A wire mesh or plank guard is also placed across the front of the car to prevent tools from falling from the front end. This guard is usually from 10 to 12 in. high and extends for the full width of the platform on each side of the seat. Wheel guards are provided on the majority of cars where the deck does not extend over the wheels. These guards may be curved to the circle of the wheel or be constructed of plank extending the full length of the deck.

Wheels

The majority of the wheels used on motor cars are of pressed steel, as this type of wheel combines strength with comparatively light weight. The flange rim and spokes of the pressed steel wheel are usually formed in one piece from ¼ or $\frac{5}{16}$ in. plate. The hubs are forged or malleable iron and are riveted or bolted in place. Cast-steel and wood center wheels and those with demountable rims are also used to a lesser extent. Cast-steel wheels cost more and are considerably heavier than pressed steel and as a rule are used only on cars of special design. Wood center wheels are also much more expensive than pressed steel and



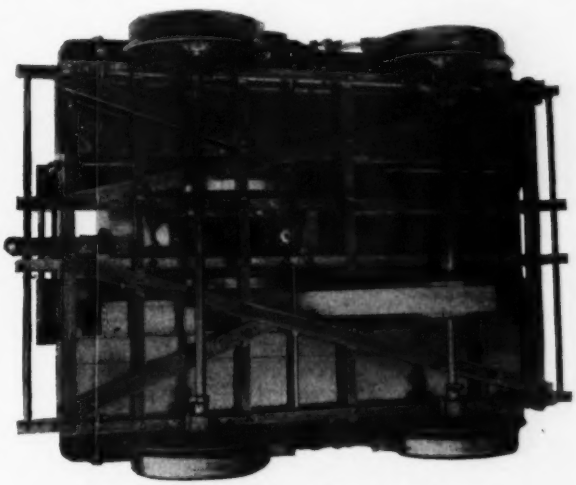
A Buda Composite Steel and Wood Motor Car Frame

their use is confined almost entirely to light inspection cars on account of their lesser weight.

The tread and flange of motor car wheels conform to M.C.B. standards, except as to width of tread and depth of flange. The A.R.E.A. standard wheel tread and flange for 16 in. and 20 in. motor car wheels are shown in the accompanying plan.

Four different sizes of wheels are used on ordinary roadway motor cars, namely, 14-in., 16-in., 17-in., and 20-in. The 14-in. wheels are used almost entirely on light inspection cars.

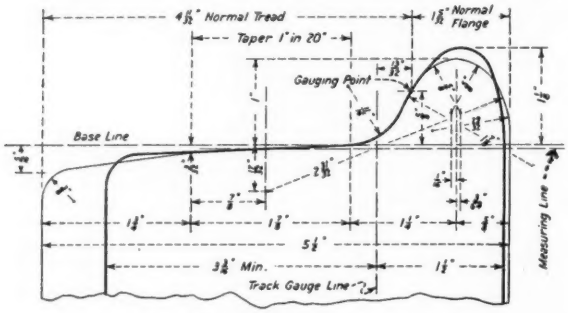
The 16-in. or 17-in. wheel may be necessary on cars driven by engines connected direct to axles, as it is necessary with this type of drive that the engine attain sufficient speed to permit it to develop the required power without driving the car at an excessive speed. For example, at a speed of 20 miles per hour a 16-in. wheel will revolve at the rate of about 400 r.p.m., while to maintain the same speed of the car with a 20-in. wheel it would be necessary to reduce the speed of the engine, with a corresponding loss of power. The use of 16 or 17-in. wheels on the lighter cars is also desirable, as they not only reduce the weight but also bring the center of gravity closer to



A Fairmont All-Wood Motor Car Frame

the rail, thereby reducing the tendency toward derailment.

It is contended in favor of the 20-in. wheel that it has more wearing surface and will outlast a smaller wheel with the same thickness of material. It is also



A.R.E.A. Standard Wheel Tread and Flange for 16-in. and 20-in. Wheels

claimed that the larger diameter makes it easier to pull the wheel over rough ground when removing it from the track and that it provides a greater clearance with less liability of damage to the pulley used with belt drives and other parts extending below the platform of the car.

Rail skids are provided on many cars to facilitate handling the wheels over the rail when placing the car on or off the track. These rail skids are located just inside the wheels on each side of the car parallel to and slightly above the rail and extend from wheel to wheel. With the present widespread tendency toward simplification and standardization, it appears feasible and desirable to confine the sizes of section motor car wheels to 16-in. and 20-in. wheels.

On roads having electrical signals, two wheels on the car must be insulated to prevent the car from setting the signals as it passes over the track. This is accomplished by means of fiber bushings and washers on the axles. On steel frame cars the insulated wheels must be on the same side of the car to prevent the current from passing through the frame.

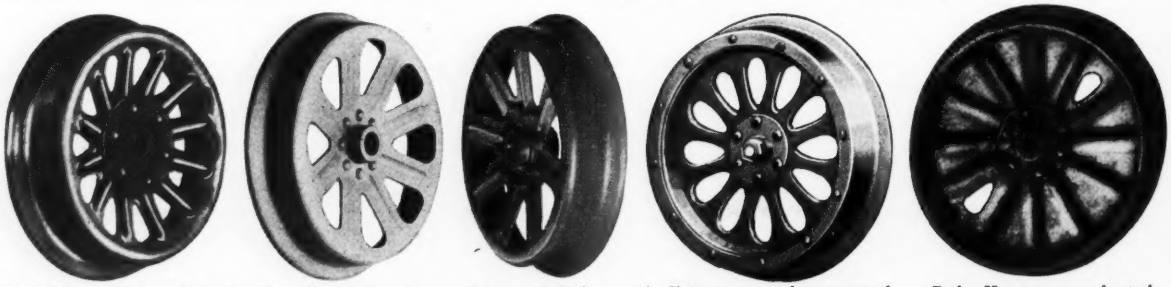
Axles

Motor car axles vary in size and design, although the bearing diameters of the axles in general use on roadway maintenance and inspection cars are confined to four sizes, $1\frac{3}{16}$ in., $1\frac{7}{16}$ in., $1\frac{11}{16}$ in., and $1\frac{7}{8}$ in. Hot-rolled axles are commonly made $\frac{1}{16}$ in. larger between bearings, while axles made from cold-rolled stock are the same size as the bearing throughout, the bearing being full size where $1\frac{1}{4}$ and 2-in. stock is used. In some cases, as with hand cars, the driving axle is made larger at some point near the middle to provide a fit for the driving gear or sprocket, and in other cases, in order to eliminate a center or steady bearing, it tapers from a diameter of $2\frac{7}{16}$ in. at the center to $1\frac{7}{16}$ in. at the bearings. The ends of all axles are turned to fit the bore of the wheel usually to a taper of $\frac{3}{4}$ in. to the foot. The wheels are held in position with a castellated nut locked to place with a cotter key. The $1\frac{3}{16}$-in. axle is commonly used on light inspection cars, while the $1\frac{7}{16}$-in. axle is employed on section cars, as a rule, and $1\frac{11}{16}$-in. and $1\frac{15}{16}$-in. axles are used on heavy duty cars.

Various specifications are followed in the selection of steel used in axles because different types of construction require different qualities in the axle. In some cases S.A.E. (Society of Automotive Engineers) specifications are followed; in others, the steel is designated according to its carbon content, as .25-.30 or .40-.50 carbon, and in still others heat-treated alloy steels are used. The following table shows five different specifications for axle steel:

	A	B	C	D	E
Carbon, per cent	0.40-0.50	0.30-0.40	0.35-0.45	0.28-0.33	0.30-0.40
Manganese, per cent	0.50-0.80	0.50-0.80	0.50-0.80	0.60-0.80	0.40-0.60
Nickel, per cent			1.00-1.50		1.10-1.50
Chromium, per cent			0.50-0.70	0.85-1.00	0.45-0.75
Sulphur maximum, per cent	0.045	0.045	0.045	0.04	0.04
Phosphorus maximum, per cent	0.045	0.045	0.04	0.04	0.04
Tensile strength	90,000 lb.	100,000 lb.	114,000 lb.	128,000 lb.	130,000 lb.
Yield point	55,000 lb.	80,000 lb.		117,000 lb.	111,000 lb.
Elongation, per cent	20	22	23	19	17
Reduction in area, per cent	50	55	67	64	54

The steels shown under specifications A and B are straight high-carbon, while C, D and E are alloy steels and are heat treated. The requirements vary with different designs and conditions and it would be impractical to standardize on any one particular steel or specification for all axles used in various types of motor cars. The dimensions of the axles of ordinary roadway motor cars are not necessarily affected by the different kinds of steel used, particularly the idler axle (as distinguished from the drive axle), nor does the character of material affect the bearing or wheel dimensions of drive axles, thus permitting a certain



Sheffield riveted pressed steel wheel. Casey-Jones riveted pressed steel wheel. Fairmont bolted pressed steel wheel. Kalamazoo wood center steel rim wheel. Buda Harvey pressed steel wheel.

Five Common Types of Motor Car Wheels

interchangeability of wheels and bearings. The standard 1½-in. axle adopted by the A.R.E.A. is shown in the accompanying plan.

While there are other factors to be considered in determining the load capacity of the car, safe loading is based very largely upon the size and condition of the axles. The conservative safe loading for motor cars with axles of various sizes is as follows:

Light inspection cars	1 3/8-in. axle,	650 lb.
Section cars	1 7/16-in. axle,	1,500 lb.
Heavy duty cars	1 11/16-in. axle,	2,000 lb.
Heavy duty cars	1 7/8-in. axle,	2,500 lb.

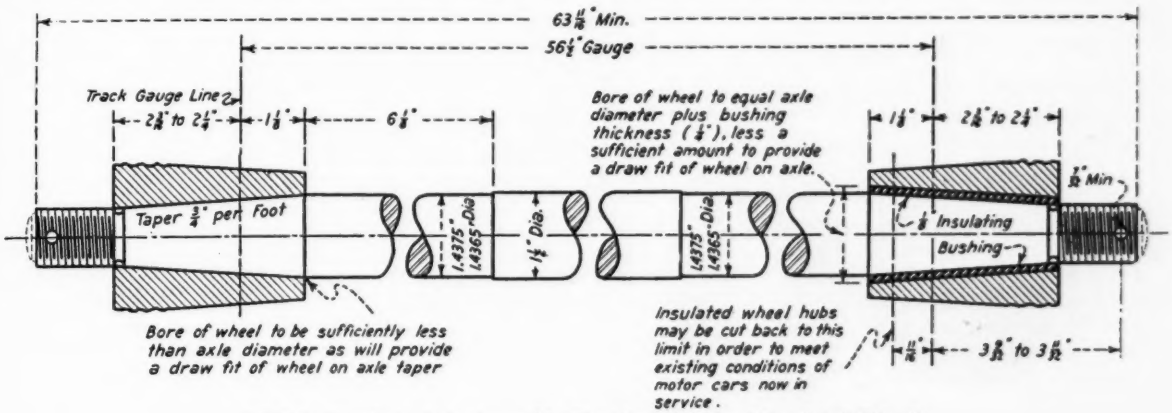
In setting up the above table, it is realized that the axle sizes as given are capable of carrying safely greater weights and the loadings are given strictly in an arbitrary sense to be followed where the condition of axles, axle boxes, wheel and frame is unknown. The question of safe loading for motor cars will be discussed in more detail in another article of this series.

Bearings

The principal bearings on motor cars are the engine bearings, transmission bearings and axle bearings. Crank-shaft bearings are of two general types; plain babbitt-lined bronze and roller or ball-bearing. Plain bearings were used exclusively until the last few years, but the majority of the engines now being built are equipped with either ball or roller bearings on account of their reduced friction and greater efficiency. These bearings are placed in the bearing housings of the engine and bolted to the crank case of the engine and can be removed for inspection or repair quite as readily as plain bearings. Connecting rod bearings on both the piston and crank-shaft ends are plain bearings of either babbitt or bronze, the piston end being a plain bronze bushing while the crank-shaft end is in two halves held together by bolts and provided with shims for taking up the wear.

Roller bearings and sleeve-type bearings are used almost exclusively on the axles of motor cars because of their value in reducing friction and wear on the axle. The earlier types of motor cars were equipped with a three-piece plain axle bearing consisting of a pedestal, brass bushing and cellar. The brass bushing fitted into the upper half or pedestal and was held in position laterally by collars at each end of the bearing. The cellar was provided with a pocket into which cotton waste saturated with oil was packed to provide lubrication. This cellar was fastened to the upper half or pedestal by bolts extending through both halves of the bearing and the frame of the car. This type of bearing is rapidly becoming obsolete. It was followed by the plain roller bearing, consisting of a cast housing, a hardened steel sleeve and a number of plain steel rollers held in position by a cage or roller race. These rollers were of various sizes, ranging from ¼ in. to 7/16 in. in diameter, depending upon the size of the journal. They were used on hand and push cars. While this bearing was an improvement over the plain brass journal bearing, it was soon followed by the spiral roller type. This design proved more satisfactory than the plain roller, particularly as to lubrication, the spiral openings acting as oil grooves. It is in general use on both motor and push cars.

The latest development in axle bearings is what is commonly termed the sleeve type with an inner race, two distinct types of which are used extensively. The principle of the two bearings is similar in that the rollers do not come in contact with the axle but roll upon a case-hardened sleeve which slips over the axle journal. The bearing casing or housing is also protected by a hardened sleeve lining which encloses the rollers. Provision is made in one type for retaining the oil in the bearing by a packing of felt rings or metal rings similar to piston rings. The other type permits of a slight amount of oil working out to prevent dirt or cinders from entering the bearing. The principal difference in the two bearings is in the rollers. In one, the rollers have a beveled flange on one end similar to that on a car wheel, which travels in a groove on the inner race or axle sleeve. The outer sleeve is also beveled to fit the flange of the roller. These beveled flange rollers are thus expected to take care of any thrust to which the car is subjected. The rollers in the other bearing are plain and are mounted in tapered races, two of which are used in each bearing assembly. This tapered feature is designed to maintain proper alinement and take care of end thrust as well as radial loads.



A.R.E.A. Standard Axle Assembly Showing Tight and Insulated Wheels

Brakes

Among the most important parts of a motor car, and most important from the standpoint of safety in operation, is the brake. The most common form of brake is a cast iron or wooden shoe applied to the tire of the wheel. Experiments have been conducted with shoes made of various materials, but cast iron and wood shoes appear to be the most satisfactory in both cost and efficiency.

The complete brake equipment consists of four hardwood brake shoes, adjustable toggles for distributing the braking force equally to all four shoes,

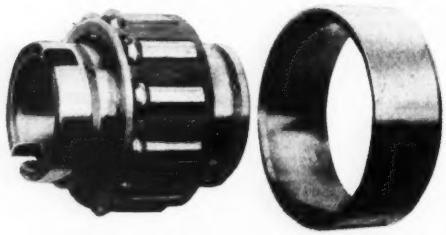
the brake shaft, bearings and lever or pedal. All parts of the brake mechanism except the shoes are constructed of steel or malleable iron.

The brakes are controlled by the operator, either by means of a lever or by a foot pedal, each of which has advantages and disadvantages. It is claimed that the use of a lever permits greater braking power than the pedal and avoids the possibility of failure of brakes through tools on the deck of the car interfering with the operation of the pedal. On the other hand, it is also claimed that the foot or pedal brake may be applied quickly by the operator without interference with other men on the seat of a crowded car and without the operator taking either hand from the controls.

Another type of brake less common than the brake shoe is what may be termed the automobile type; it consists of a band passing around a pulley or drum, the braking effect being accomplished by tightening the band which is lined with friction brake lining. In some cases, the brake band is applied to one or more of the wheels. The brake band is more effective than the brake shoe on account of the greater friction surface, but it is more expensive in first cost as well as in maintenance, and it is more likely to get out of order than the brake shoe.

Fuel System

The fuel system comprises a gasoline storage tank having a capacity sufficient for 50 to 75 miles operation, the necessary fuel piping, strainer and shut-off



Bower Ringsealed Roller Bearings

cock and the carburetor. The fuel tank is constructed of copper, galvanized iron or terne plate, and is mounted either under the seat of the car or directly on the engine, usually in such a manner that the gasoline will flow by gravity to the carburetor. The fuel lines of the earlier types of cars were constructed of rubber tubing, this material being employed to avoid breakage of fuel lines through the vibration of the car and engine. The rubber was of short life, however, and has been replaced by copper tubing which has proved more satisfactory. The effect of the vibration has been overcome by making a loop in the fuel line to lessen its rigidity. To insure further flexibility the copper tube is sometimes annealed after forming. The strainer catches any sediment in the gasoline and prevents it from entering the fuel line and either stopping up the line or the needle valve controlling the fuel supply to the engine.

The carburetor is a device for feeding the gasoline to the engine as required and for mixing it with the proper amount of air for combustion. It consists essentially of a float chamber connected to the fuel line and a mixing chamber connected to the intake manifold or to the crank case, depending upon the type of engine. The float chamber contains a float which admits gasoline from the supply tank to the carburetor as required. The gasoline passes from the float chamber to the mixing chamber where it is picked up by the incoming air and carried to the cylinder. The gasoline is regulated by a needle valve as it passes through the carburetor and the air by a valve which is controlled by means of a spring and the throttle lever. In operation, the needle valve is set at a fixed opening and the speed of the engine is controlled by the amount of air admitted and by advancing and retarding the spark.

Weights of Cars

Motor cars must be handled on and off the track frequently, often up and down embankments, usually by a few men. They must, therefore, be as light in weight as possible, consistent with the required strength. One of the principal requirements in cars for one and two-man service, such as signal work and bridge and track inspection, is light weight. Regardless of how efficient the car may be in operation, if it weighs too much to be handled properly, it is impracticable and unsafe for such work.

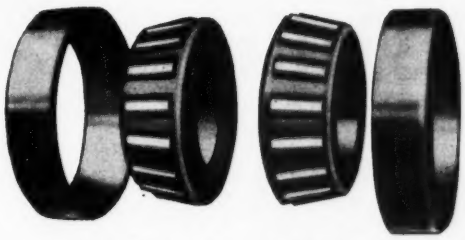
The manufacturers are meeting this problem by employing materials and construction which permit of making the cars lighter in weight and at the same time maintaining the strength essential to safety in operation. Aluminum and aluminum alloys are used to a considerable extent in reducing the weight of cars, which naturally add to the cost. Therefore, beyond a certain point, the question of reduction of weight is one of cost.

One manufacturer advises that the cost of the car increases in proportion to the reduction in weight, while another states that the cost of the light one-man inspection car increases approximately one dollar for each pound of further reduction in weight.

The following table shows the weights of 20 cars and the classes of service for which they are designed. Only cars used in ordinary maintenance of way service are included in the list. The weights of other cars, more or less special in design, vary to such an extent that it is not worth while to include them.

Type of Car	Weight
One man light inspection car	400 lb.
One man light inspection car	410 lb.
One to three men light inspection car	460 lb.
One to three men light inspection car	500 lb.
One to three men light inspection car	510 lb.
Light section car	710 lb.
Light section car	810 lb.
Standard section car	900 lb.
Standard section car	950 lb.
Standard section car	1,000 lb.
Standard section car	1,000 lb.
Standard section car	1,045 lb.
Standard section car	1,070 lb.
Standard section car	1,080 lb.
Heavy section, extra gang and bridge gang cars	1,175 lb.
Heavy section, extra gang and bridge gang cars	1,225 lb.
Heavy section, extra gang and bridge gang cars	1,250 lb.
Heavy section, extra gang and bridge gang cars	1,315 lb.
Heavy duty cars	1,500 lb.
Heavy duty cars	1,700 lb.

The proper distribution of weight is an important factor in handling motor cars on and off the track. This is usually accomplished by placing the engine well over the axle opposite the lifting end and otherwise distributing the weight so that it will be well balanced on this axle when one end of the car is raised. To further facilitate the handling of the car, one wheel of the car is loose, permitting it to revolve instead of sliding, as would be the case if both wheels were tight on the axle. The following table gives



Timken Double-Tapered Roller Bearings

typical examples of the lifting weight as compared to the total weight of the car:

Total Weight of Car	Weight of Lifting End	Weight Opposite Lifting End
469 lb.	205 lb.	165 lb.
1,000 lb.	230 lb.	325 lb.
1,045 lb.	260 lb.	340 lb.
1,080 lb.	303 lb.	353 lb.
1,225 lb.	290 lb.	470 lb.

The lifting weight of the first car in the above list is still further reduced from 205 lb. to 159 lb. by the use of extension handles which give the operator added leverage when they are extended.

Rail Production Increased in 1929

THE production of steel rails in the United States during 1929 totaled 2,722,138 gross tons, or 74,645 tons more than in 1928, but 495,511 tons less than in 1926, the year of greatest production since 1913. This increase in the total production occurred in spite of the fact that the production of rails weighing less than 100 lb. per yd. decreased 71,382 tons, this being more than offset by an increase of 146,027 tons in rails weighing 100 lb. per yd. or more. These figures are taken from statistics issued by the American Iron and Steel Institute, which are further summarized in the following statements and tables. These statistics include, besides T-rails of standard patterns rolled for use on steam railways, also girder and high T-rails for electric and street railways. For recent years, the tonnage of such rails was as follows: 1922, 128,878; 1923, 130,056; 1924, 85,533; 1925, 98,620; 1926, 116,374; 1927, 99,621; 1928, 113,150, and 1929, 109,678 gross tons.

Production of Rails by Weight per Yard, 1916-1929

Years	Under 50 pounds	50 and less than 85	85 and less than 100	100 and less than 120	120 pounds and over	Total gross tons
1916	295,535	566,791	1,225,341	766,851		2,854,518
1917	308,258	882,673	989,704	763,526		2,944,161
1918	395,124	665,165	888,141	592,462		2,540,892
1919	263,803	495,577	965,571	478,892		2,203,843
1920	489,043	433,333	952,622	729,118		2,604,116
1921	211,568	214,936	902,748	849,566		2,178,818
1922	265,541	274,731	728,604	902,900		2,171,776
1923	272,794	300,907	864,965	1,465,850		2,904,516
1924	191,046	213,274	853,431	1,175,581		2,433,332
1925	163,607	219,648	765,371	1,636,631		2,785,257
1926	197,260	256,287	797,662	1,966,440		3,217,649
1927	161,836	173,257	539,445	1,314,424	617,524	2,806,486
1928	134,197	125,726	465,393	1,203,749	718,428	2,647,493
1929	141,362	102,944	409,628	1,233,599	834,605	2,722,138

Production of Rails by Processes, Gross Tons, 1914-1929

Years	Open-hearth	Bessemer	Electric	Rerolled *	Total
1914	1,525,851	323,897	178	95,169	1,945,095
1915	1,775,168	326,952	.....	102,083	2,204,203
1916	2,269,600	440,092	.....	144,826	2,854,518
1917	2,292,197	533,325	.....	118,639	2,944,161
1918	1,945,443	494,193	.....	101,256	2,540,892
1919	1,893,250	214,121	50	96,422	2,203,843
1920	2,334,222	142,899	297	126,698	2,604,116
1921	2,027,215	55,559	5	96,039	2,178,818
1922	2,033,000	22,317	.....	116,459	2,171,776
1923	2,738,779	25,877	118	139,742	2,904,516
1924	2,307,533	16,069	.....	109,730	2,433,332
1925	2,691,823	9,687	.....	83,747	2,785,257
1926	3,107,992	12,533	.....	97,124	3,217,649
1927	2,717,865	1,566	.....	87,055	2,806,486
1928	2,580,141	2,718	438	64,196	2,647,493
1929	2,662,163	3,486	723	55,766	2,722,138

* Rerolled from old steel rails.

Rails weighing 100 lb. and less than 120 lb. per yd. were produced to the total of 1,233,599 tons, or 29,850 tons more than in 1928, but 80,825 tons less than in 1927. The production of rails weighing 120 lb. per yd. or more was 834,605 tons, or 116,177 tons more than in 1928, which year in turn showed a greater production of this weight than in 1927. The production of rails weighing 100 lb. per yd. or more represented 75.9 per cent of the total in 1929, as compared with 72.6 per cent in 1928, 68.8 per cent in 1927, and 39 per cent in 1921.

Production of Alloy-Treated Steel Rails, 1920-1929

	Total production.	Production by alloys		Production by processes		Production by weight per yard				
Years	Gross tons	Titanium	Other alloys	Open-hearth and elect.	Bessemer	Under 50 lb.	50 and under 85 lb.	85 and under 100 lb.	100 and under 120 lb.	120 lb. and over
1920	12,909	11,652	1,257	12,909	.....	.....	514	5,069	7,326	
1921	6,276	2,804	3,472	6,276	.....	.....	71	4,277	1,928	
1922	3,163	2,493	670	3,163	.....	.....	321	835	2,007	
1923	2,142	346	1,796	2,142	.....	.....	56	317	1,769	
1924	5,167	1,696	3,471	5,167	.....	.....	.....	847	4,320	
1925	4,009	1,616	2,393	4,009	.....	70	47	.....	3,892	
1926	4,216	1,099	3,117	4,216	.....	.....	42	1,027	3,147	
1927	1,265	.....	1,265	1,265	.....	.....	.....	374	391	500
1928	6,453	3,711	2,742	6,453	.....	29	.....	879	1,652	3,893
1929	1,965	486	1,479	1,965	.....	100	.....	748	967	150

The production of alloy steel rails in 1929 was only 1,965 tons, or less than for any year for which records are shown except 1927, being 4,488 tons under 1928 and 10,943 tons under 1920. Titanium rails dropped from 3,711 tons in 1928 to 486 tons in 1929, while manganese rails (10 per cent manganese and over) decreased from 2,713 tons in 1928 to 1,379 tons in 1929.

While the production of Bessemer rails in 1929, namely, 3,486 tons, was greater than in either 1928 or 1927, it is safe to say that Bessemer steel is confined to the light rails used for industrial purposes and no longer gets into steam railway tracks. The output of rerolled rails showed a further decrease, amounting to 55,766 tons in 1929, as compared with 64,196 tons in 1928 and 139,742 tons in 1923.

The Railway Industry at a Glance

	Month of February			Two Months Ending with February		
	1930	1929	Decrease, 1930 Under 1929 Per Cent	1930	1929	Decrease, 1930 Under 1929 Per Cent
Total operating revenues	$427,940,570	$476,155,913	10.0	$879,133,774	$963,661,185	9.0
Expenditure for maintenance of way and structures	**53,224,541**	**55,542,835**	**4.2**	**108,093,446**	**113,965,964**	**5.3**
Total operating expenses	330,579,336	350,548,850	5.7	687,014,559	720,302,666	4.6
Net railway operating income	59,452,011	84,723,649	29.8	115,169,128	161,914,616	28.9

Laying 1 3/4 Million Tons of

Laying the final rail of the longest continuous stretch of 130-lb. track in the world. Below—Setting the rail into position

WHEN the Pennsylvania drove the last spike against the final 130-lb. rail to be laid in its westbound track at Forty-First street, Chicago, shortly before noon on March 5, it brought to completion an important part of a rail-renewal program which it has been following for 14 years, and which gives this road the longest continuous stretch of 130-lb. rail in the world. This program in its entirety has already involved the laying of 8,742 miles of main track with 130-lb. rail, at a cost of more than $100,000,000 for rail and fastenings alone. In addition to the 2,852 miles involved in the main tracks of this road between New York and Chicago, the Pennsylvania has also laid 5,620 miles of 130-lb. rail in other main tracks between Philadelphia, Pa., and Washington, D. C., between Pittsburgh, Pa., and St. Louis, Mo., and between Columbus, Ohio, and Cincinnati.

While these figures are, in themselves, impressive, the magnitude of the rail-laying program undertaken by this road becomes more readily apparent when an analysis is made of the work involved, the tonnage of the rail and incidental material required and the total cost to lay this large mileage of heavy section rail. These items stand out in sharper contrast when it is understood that, except for a comparatively small tonnage of 125-lb. rail which was laid for experimental purposes, the 130-lb. section replaced 100-lb. rail which had been standard on the Pennsylvania since 1892, when this latter section was first adopted as a substitute for the 85-lb. section.

First 130-Lb. Rail Was Laid in 1916

The first 130-lb. rail used by the Pennsylvania was laid in June, 1916, and the laying of this section has continued year by year at an average rate of about 125,000 tons annually. The largest tonnage for any one year was placed in 1928, while the program for 1930 calls for the laying of a still larger amount, 310,000 tons. Under the program adopted in 1916, which has since been followed consistently, the new section has been installed as needed to replace the most badly worn of the rail in service, except that in some instances rail only partly worn was replaced to eliminate short gaps between sections of the heavier rail, in order to give continuous stretches of 130-lb. rail over considerable distances. It is the intention of this road to continue its present program until all of the rail in the main tracks of its heavy traffic lines is replaced with 130-lb. rail, and it expects to complete the laying of this section between other eastern and western terminals during the present year.

Large Mileage of Rail Already Laid

In reconstructing its tracks, the Pennsylvania has laid 1,730,808 tons of 130-lb. rail up to the present time, 582,803 tons of which were applied in main tracks between New York and Chicago, and the remainder, or 1,148,005 tons, in main tracks between the other points mentioned. In addition to this rail, which represents only that in main track, a large amount of rail of this weight has been required for use in turnouts, crossovers, and slip switches and in the construction of switch points, of which there are many thousand in the tracks already completed. While a record is not readily available of the number of frogs, switches and incidental items of material, such as guard rails, guard rail clamps, riser plates, bridle rods, rail braces, etc., which are necessary for the installation of turnouts, the magnitude of the task involved in the installation of the switches alone is self-evident.

When it comes to the rail fastenings, it is even more

ns of 130-lb. Rail

Pennsylvania links New York and Chicago with the world's longest continuous mileage of heavy rail — Part of a larger program

The Golden Arrow, the First Train to Run Between New York and Chicago Over 130-Lb. Rail

difficult to visualize the total requirements. Whether new spikes were used throughout or whether part of the spikes already in service were reused is not important here. In either case, it was necessary to pull approximately 108,500,000 spikes and to drive an equal number. In the tracks between New York and Chicago, alone, this number is 36,500,000. The pairs of joint bars used in these tracks numbered 772,264 and 1,681,036 were used in other main tracks, making a total of 2,453,300. Other materials which were used are as follows:

	Tracks, New York to Chicago	Other tracks	Totals
Bolts	3,100,000	7,241,000	10,341,000
Nut locks	3,100,000	7,241,000	10,341,000
Rail anchors	4,662,000	10,057,800	14,719,800
Tie plates	12,355,780	26,655,870	39,011,650

In addition to the features which have been mentioned and which relate only to the rails and fastenings, a large amount of incidental work was necessary in connection with the rail laying, some of which would have been done in the ordinary course of maintenance by the regular maintenance forces, but which, as a matter of fact, was done by the rail-laying forces. This includes the renewal of ties, ballasting, surfacing, distributing materials and the uncoupling and loading of the released rail. Work done by other forces, which was incidental to or made necessary by the installation of the heavier rail, included the strengthening of embankments, ditching and the rebuilding of numerous interlocking plant layouts. Signal department forces also accompanied the rail gangs for the purpose of bonding the rails and taking care of other work in connection with the signals, which the rail laying made necessary. No changes were made in gradients or alinement, and no changes of any consequence were made in track layouts as a result of or incidental to the installation of the heavier rail.

What the Work Cost

When one considers the cost of this work, he is again confronted with large figures. The rail alone in the tracks between New York and Chicago cost $23,262,977, while the cost of the remainder of the 130-lb. rail in service was $50,047,490, a total of $73,310,467. The total costs of all of the fastenings which have been mentioned, except spikes, were $8,969,392 and $19,350,323 respectively, or a total of $28,319,715, making a grand total for both rail and fastening of $101,630,182. These figures are for material only and do not include the cost of application. The system of keeping railway maintenance of way accounts prescribed by the Interstate Commerce Commission does not lend itself to an easy segregation of costs for specific projects and, as the keeping of a separate record over a period of years for the laying of this rail and the work incidental thereto would have involved extra bookkeeping at an unreasonable expense, the exact figures for the cost of the labor of application are not available.

Work Incidental to Rail Laying

In addition to the renewal of ballast and ties, which was incidental to the rail laying, although, in general, these are ordinary maintenance operations which would have been performed if the new rail had not been laid, a large amount of extraordinary ditching has been done during the last two or three years in connection with the rail-laying program, at a cost of approximately $3,000,000. It is possible that this ditching would also have been done regardless of the rail renewal, since the maintenance of way program of this road has, for several years, included a large amount of ditching work. In any event, special arrangements were made to do the ditching and such strengthening of embankments as was desirable, in advance of the rail laying, in order that a finished job in every respect might be obtained.

Because of the density of traffic and the physical conditions on many sections of the road, about 90 per cent of this rail was laid by hand. No special supervisory forces were employed, each supervisor and assistant supervisor being in direct charge of the rail-laying operations on the territory under their jurisdiction.

The gangs for this purpose consisted generally of 68 men and 4 foremen, the assignments being about as follows: Pulling spikes, 12 men; throwing out the old rail, 6 men; setting the new rail in place, 22 men; applying joints, 6 men; spiking and gaging, 14 men; bonding, 6 men; flagging, 2 men. While these assignments varied somewhat with the conditions encountered and the progress of the work, they are typical of the organization of the hand-laying gangs. Gangs of this size laid an average of from 200 to 250 rails a day, this

Coupling up the rail that completed the 130-lb. track between New York and Chicago

variation being influenced by the traffic, the grades and the alinement.

On certain sections of the road, conditions permitted the use of power equipment for laying rail. This included crawler cranes for unloading and distributing the new rail and other track materials, rail-laying cranes, locomotive cranes, rail loaders, power adzing machines, pneumatic spike pullers, spike drivers, pneumatic and electric nutting tools, and power rail and bonding drills. In addition, both electric and pneumatic tie tampers were used for surfacing the rail, whether laid by hand or with power machines.

Organization of Gangs Using Power Equipment

The gangs which used power equipment consisted of 4 foremen, 2 assistant foremen, 5 machine operators and 74 men. The following organization was typical of rail-laying gangs where power machines were used: Unloading rails and track material, 1 foreman, 1 operator and 10 men, with a crawler-type crane working from the cars; pulling spikes, removing rail anchors and bolts, 1 foreman and 10 laborers, 2 of whom cut off old bolts by mean of acetylene torches; 1 assistant foreman in charge of 15 men, 4 of whom were engaged in removing joint bars and bond wires, 4 men and 1 operator were assigned to handle a portable air compressor and two pneumatic spike pullers, 2 men were equipped with claw bars to pull spikes which the pneumatic spike pullers could not get hold of, and 4 were assigned to throwing out the old rail; another foreman was in charge of 15 men and 1 operator who were engaged in laying the rail, setting spikes, and applying rail anchors and joints, this group being equipped with a gasoline-driven locomotive crane of 10-tons capacity, a rail-laying crane of smaller capacity or a rail layer; 1 assistant foreman with 1 operator and 11 men, equipped with a portable air compressor drove the spikes and applied and tightened the nuts on the bolts. In addition, there were 2 lookout men and 4 signal men, 2 of whom operated the bonding drill and the other 2 applied the bonding wires. Following the main rail laying gang, 1 foreman, 1 operator and 10 men loaded the old rail and track material with a rail loader or a crawler crane. One general foreman, reporting to the supervisor, was in charge of the entire operation. This gang of 86 men, 14 more than were included in the hand-laying organization, owing to the more uniform conditions over the territory where the power equipment was used, was able to replace an average of 600 rails a day, with less variation from the average, in contrast with the 200 to 250 rails laid by the hand method.

Lackawanna Announces Awards

EIGHTEEN foremen on the Delaware, Lackawanna & Western were awarded prizes for excellence in track maintenance in 1929. There were nine first prizes of $100 each and nine second prizes of $50 each. In addition, each of the prize winners was given a silver medal. Following are the names of the winning foremen and their headquarters.

First prize—C. Tarantino, Section 5, Morris & Essex division, East end, Delawanna, N. J.; E. Santucci, Section 14, Morris & Essex division, West end, Dover, N. J.; R. McDonald, Section 45, Main Line Southern, Moscow, Pa.; M. Fernan, Section 61-2, Main Line Northern, New Milford, Pa.; J. Dodge, Section 83, Buffalo division, East end, Lowman, N. Y.; M. Debrano, Section 98, Buffalo division, West end, Cohocton, N. Y.; F. Pignono, Section 405, Bloomsburg division, Forty Fort, Pa.; F. Cipriani, Section 512, Syracuse division, Homer, N. Y.; and J. Excell, Section 602, Utica division, Greene, N. Y.

Second prize—P. Lamantino, Section 204, Morris & Essex division, East end, Roseville avenue, Newark, N. J.; L. DiSantis, Section 19, Morris & Essex division, West end, Hackettstown, N. J.; J. McDonald, Section 46, Main Line Southern, Elmhurst, Pa.; R. Griffiths, Section 54, Main Line Northern, La Plume, Pa.; D. Pedro, Section 74, Buffalo division, East end, Oswego, N. Y.; J. Tenney, Section 114, Buffalo division, West end, North Alexander, N. Y.; T. Shingler, Section 411, Bloomsburg division, Berwick, Pa.; A. Speziale, Section 515, Syracuse division, Tully, N. Y.; and J. Furnari, Section 605, Utica division, Oxford, N. Y.

NEW RAILWAYS IN AFRICA.—Italian Colonial Railways in Lybia, Eritea and Somalia will be developed and extended by a private company, under a concession granted recently by the Italian government. The present mileage in Lybia is 270 kilometers; in Eritea, 310 kilometers, and in Somalia, 30 kilometers.

WHAT'S THE ANSWER?

Have you a question you would like to have someone answer?

Have you an answer to any of the questions listed below?

QUESTIONS TO BE ANSWERED IN THE JULY ISSUE

1. Preparatory to ballast renewal, is it advisable to restore the shoulder of the subgrade? If so, should the shoulder be raised above the bottom of the old ballast? What precautions, if any, should be taken?

2. At what intervals should motor car refuges be provided on long bridges?

3. In the maintenance of rail joints, what details should be given special attention?

4. To what extent is it practical to protect the interior surfaces of steel tanks against corrosion? What means can be employed?

5. What limitations should govern the use of second-hand track spikes? Should they be used when laying new rail?

6. What, if any, practical means can be taken to guard against slipping or tripping on floors and platforms at passenger stations?

7. When ballasting track, should the ties be tamped throughout their length? If not, where should the tamping be done?

8. Should bridge inspectors be part of the local division bridge organization, or should they be system employees?

Practical Methods of Bank and Channel Protection

Where erosion from ditches or small streams threatens the stability of the roadbed, what methods of bank and channel protection are most practical or effective?

Riprap and Rock-Filled Cribs Are Effective

By G. STAFFORD
Section Foreman, Canadian National, Rosebud, Alta.

An inexpensive method of protecting embankments, the stability of which is threatened by erosion, is the application of heavy broken stone deposited at random. In the more important situations, however, a carefully laid riprap wall should be installed. To do this properly, a trench should be cut along the foot of the embankment, deep enough to insure that the riprap wall will not be undermined, and the riprap should then be carefully laid close together in order to avoid any openings through which erosion might occur. The size of the stone should be what is known as one-man or heavier. Both ends of the wall should be turned into the embankment far enough to prevent the water from getting behind the wall and washing it out.

Another method which is very effective where protection is necessary against larger streams and also for channel protection, is a rock-filled timber crib. There is a particular advantage in the use of this construction in sections where timber is plentiful and rock scarce, since a minimum amount of rock is required in filling the crib. This form of construction is also adapted particularly for side hill protection, since its installation requires a minimum amount of excavation.

This form of protection is being used extensively on my section, where considerable river diversion is in progress. The practice is not new, however, since a number of rock-filled cribs are still in service which were constructed more than 20 years ago, some of them to prevent erosion behind bridge abutments where streams approach the openings at an acute angle.

Stream Diversion Is Most Effective

By ASSISTANT DISTRICT ENGINEER

Where erosion from ditches or small streams threatens the stability of the roadbed, the most effective method of protecting against damage is to relocate or divert the stream. It is frequently possible to do this by installing an additional culvert at or near the point where the stream first approaches the embankment. In this way the water is carried more quickly to an outlet, or at least is carried across the embankment where it will do less damage. Erosion on the downstream side of an embankment usually is less troublesome than on the upstream side.

Stream diversion is not always practical, however, and when this cannot be done, a deflecting wall of concrete or of less permanent character, such as riprap, can frequently be constructed in such a manner as to prevent erosion.

Still another method is frequently quite effective, although it is more expensive. In this method concrete pipe or vitrified sewer pipe of sufficient size to carry the maximum flow is laid in the bed of the ditch or stream and covered with heavy porous ma-

terial such as crushed rock or slag. This method necessitates a careful investigation and study of the drainage area and probable maximum flow in order to make sure that the pipe will be of sufficient size to carry the runoff during extreme high water; otherwise, the pipe will not be fully effective and the surplus water may cause considerable damage to the roadbed, in which case the expense of the installation will not be justified and may be entirely wasted.

Each of the methods mentioned has come under the writer's observation and has been found effective in conditions for which it is adapted. Every case of erosion should be studied carefully and the methods adopted which will be most practicable and effective. the local conditions and other factors being fully considered.

Paving or Riprap Provides Remedy

By C. S. Robinson
Engineer Maintenance of Way, Maine Central, Portland, Me.

Where erosion from ditches or small streams threatens the stability of the roadbed, several methods may be effective, depending upon the local conditions, but, in general, an adequate installation of good sized riprap, carefully laid on the slope against which the action of the water is directed, provides the remedy which is sought.

Where the damage resulting from the erosion is extensive, a larger expenditure is usually justified for the relocation or diversion of the stream, if the railway can secure the necessary property or the local condition permits this diversion to be made.

Arching the Grade Line

Should pipe culverts be installed on a straight-line grade or should the grade line be arched? Why?

Depends on Character of the Foundation

By H. B. Barry
Assistant Chief Engineer, St. Louis-San Francisco, St. Louis, Mo.

When pipe culverts under tracks are laid on ordinary ground, they should be cambered somewhat so that the section of the culvert under the track will be above the grade line, or above a straight line drawn between the ends of the culvert, in order to take care of the settlement which is certain to occur. The amount of camber will depend on the character of the soil on which the pipe is laid. For ordinary soil this should be about 2 in. for pipe lengths between 20 ft. and 30 ft.; 3 in. for lengths between 30 ft. and 50 ft.; and 4 in. for lengths more than 50 ft. If the pipe is laid on rock, hard pan or other very firm material, no camber is necessary.

Should Be Arched to Take Care of Settlement

By Assistant District Engineer

Whether a culvert should be installed on a straight-line grade or whether the grade line should be arched depends entirely upon the foundation or soil condition. If a culvert is installed in soil that is likely to settle as a result of the superimposed weight of the embankment, it is good practice to arch the culvert to take care of this settlement. On the other hand, if the foundation for the culvert is such that no settlement is likely, or if a foundation has been specially prepared, I do not believe that it is necessary to arch the culvert.

The reason for arching the culvert is to get a straight-line grade after the culvert and embankment have settled to their final position. If a culvert which is placed on a solid, or nearly solid, foundation is arched, however, the camber probably will not settle out and the culvert will always hold back a certain amount of water. If the stream carries sand, gravel or other abrading material, the floor of an arched culvert will erode more rapidly than one which is laid on a straight-grade line, because the abrasive particles carried in the water will strike against the upstream side of the floor of the arch. For these reasons it is important that the soil conditions be studied carefully in order that sufficient camber shall be applied to avoid the possibility of a sag in the culvert when final settlement has taken place, and likewise to insure that no greater amount of camber shall be used than is necessary to give a straight-line grade after final settlement.

Control of Tie Splitting

When ties show a tendency to split after they are installed in the track is it practicable to curb this tendency? If so, by what means?

Does Not Believe It Is Practicable

By Engineer Maintenance of Way

The best place to curb the tendency of ties to split is in the seasoning yard where incipient splitting usually occurs. Many of the woods from which ties are manufactured check badly during the period of seasoning, unless definite steps are taken to prevent it. This is best done by the application of S-irons, or similar anti-splitting devices, as soon as the seasoning cracks appear. In some cases, however, this method of control is not adequate, in which event the application of bolts or collars is necessary in order that the ties may remain in usable condition after the seasoning period subsequent to treatment.

Despite these precautions, however, which are in common use at all up-to-date treating plants and in all well supervised seasoning yards which are detached from treating plants, a small percentage of the ties will get into the track without having been properly equipped with anti-splitting devices. It also happens occasionally that no apparent checking occurs until after the ties are installed. The latter situation is most likely to develop in extremely dry climates, such as the desert territory of the western and southwestern states. Again, splitting sometimes results from spiking, even in ties which have not shown any previous indications of checking.

While it is possible, in some instances, after the ties are installed, if the checking is not too far advanced, to curb the tendency to split by the application of collars or bands similar to but lighter than the pile rings which are used in driving piles, I do not consider this a practical method adapted for general use, owing to the amount of time required for its application and the cost of doing the work. I am informed that one road found it of considerable advantage to make an application of heavy petroleum, by sprinkling, to zinc-treated ties which were checking and shattering in a dry climate. Since the ballast was gravel, the application of the oil served the double purpose of retarding materially the process of failure in the ties and of keeping down the dust from the

ballast. I know of no other methods than these, and they are adapted for special cases only and not for general use, since the cost will usually exceed the amount of the savings which can be expected from reclaiming the occasional ties which fail from splitting after they are installed, provided they have been given proper attention during the pretreatment seasoning period and immediately after treatment.

Will Not Prolong the Life of the Tie

By Supervisor of Maintenance

If the ties have been given the proper attention during the seasoning period and anti-splitting devices used when necessary to control the tendency to check and split before treatment, only a small percentage of the ties will show any tendency to split after they are inserted in track. It is true, of course, that no matter how carefully the seasoning may have been supervised in this respect, some ties will split after they are in the track. I have never known, however, of any organized effort having been made to control this form of failure after the ties are in the track.

I doubt the practicability of any form of control at this stage of the service life of the tie. Treatment seldom, if ever, penetrates to the center of the tie, so that splits which open up after the tie is applied are quite certain to expose untreated wood. It is equally certain that infection of the exposed untreated wood will take place almost immediately, after which the bringing back together of the split end faces is not likely to prolong the life of the tie sufficiently to pay the cost of doing the work.

Joints in Crossings

When laying rail, what measures, if any, should be taken to avoid placing joints in highway or street crossings? By what means can this be done?

Welding Provides the Best Means of Avoiding Joints in Crossings

By L. C. Stahl

Assistant Engineer, Central of Georgia, Columbus, Ga.

In my opinion, unnecessary work and expense are involved in any attempt to space joints by cutting rails or using short rails in order to avoid placing joints in street or highway crossings. This is especially true in cities or villages where the crossings are close to each other. This practice necessarily requires the use of short rails, which increases the number of joints and therefore weakens the track structure in the vicinity of the crossing or crossings. The poor track conditions and the extra maintenance which always result from the presence of joints in crossings can be practically eliminated, however, by welding the joints, using a portable welding outfit for this purpose.

Use Shorter Rails Where Practicable

By S. A. Mears

Section Foreman, Missouri-Kansas-Texas, San Antonio, Texas

Where the width of the crossing will permit, it has been my practice to readjust the location of the joints approaching the crossing by using several rails which are two or three feet shorter than the standard, so as to bring the joints outside the limits of the crossing plank. This is objectionable, however, because it introduces short rails and additional joints in the track and also because it is difficult, if not impossible, to avoid laying square joints, if the width of the crossing approximates the length of the rails in use, at a point where track conditions are often less satisfactory than elsewhere.

If the width of the crossing is greater than the length of the standard rail, this method cannot be applied, and the only recourse is to use rails of extra length, which is troublesome and expensive, or to weld the joints through the crossing. Where this latter method is followed, the welding should be done so that no joint comes within 15 ft. of the crossing.

Welded Joints Will Prolong the Life of the Rail

By J. F. Peterman

Yard Foreman, Minneapolis, St. Paul & Sault Ste. Marie, Superior, Wis.

In the interests of good maintenance and smooth riding track, joints in street or highway crossings should always be avoided. I do not favor the use of short rails to readjust the location of the joints approaching the crossing, as this practice only partially cures the troubles which we should eliminate entirely. This practice is an inheritance from an earlier day before the development of electric or oxy-acetylene welding and should be replaced by more modern methods.

The best way to avoid joints in street or highway crossings is to join two or three rails, depending on the length of the crossing, by means of butt welding. As soon as the weld is completed, angle bars should be applied and bolted up tight, in the same manner as if the weld did not exist. The welding should be done at a convenient location near the crossing. When ready, the installation can be made quickly with a crew of seven men by using two dollies and pulling the rail into place with a standard section motor car.

While the initial expense will be somewhat greater than by the older method, this will be more than offset by the reduction in maintenance cost, and the life of the rail and joint fastenings will be prolonged materially.

Three Methods Can Be Used

By Assistant District Engineer

There are three methods which are commonly used when laying rail through street and highway crossings to avoid placing joints in the crossings. The first one cannot be used through long crossings, but the other two are adapted for use through any type of crossing.

The first method, which is probably the oldest in use, consists in either cutting a rail, if necessary, or selecting a number of short rails, and laying them in such a manner as to bring the joints outside the limit of the crossing. While this is a simple method and easily applied, it is not altogether satisfactory on lines of heavy traffic, for the reason that the readjustment of the rail lengths to bring the joints outside the crossing frequently makes it necessary to lay even joints for several rail lengths on both sides of the crossing.

The second method is to have a sufficient number of 66-ft. rails on hand, which will permit the joints to be located outside the crossing, without the necessity of cutting rails or using short rails. Occasionally the length of the crossing is such that this method is not advisable.

The third method, which can be applied to all

crossings, consists in welding the rails together and reapplying the joints or angle bars over the weld. It can be used regardless of the length of the crossing, since it provides a continuous rail of any desired length. The joint fastenings are reapplied to the rail merely as a precaution against breakage of the weld.

Protecting Piling at Cut-Off

What is the most effective method of protecting treated piling from decay at the point of cut-off?

Creosote and Roofing Pitch Are Recommended

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Wynne, Ark.

As soon as the cut-off is made, the top of the pile should be thoroughly mopped or painted with hot creosote as long as the oil will continue to penetrate the wood. These applications should be made at intervals of approximately 30 min. until the surface is saturated. After the last application dries somewhat, a mixture should be made of three parts of roofing pitch and one part of creosote and applied hot to a minimum thickness of ⅛ in. A layer of one-ply roofing felt, well saturated with creosote, should be applied immediately, and the upper surface painted with the tar creosote mixture.

If this work is being done in a temperature of 60 deg. or higher, a second layer of paper, well saturated with creosote should be applied in order to avoid pulling the tar and paper away from the top of the piling when the cap is being placed. If the temperature is below 60 deg., however, the tar will harden sufficiently so that the second layer of roofing paper is unnecessary.

When the load is placed on the cap, the tar is pressed into the soft fibers of the wood and into any checks which may be in the head of the piling while the roofing paper holds the tar intact until all openings are well sealed between the cap and the piling. This eliminates any chance of water getting into the exposed part of the untreated wood. All caps should be attached to the piles by means of angle irons and bolts instead of drift bolts, which further tends to eliminate the possibility of any water getting into the untreated part of the pile at the points where the drift bolts are driven.

Where this method of attaching the cap to the pile is used, the cap can be removed in about half the time and at half the cost without danger of damaging the head of the pile. This practice also eliminates the hazard of accidents which often occur in pulling drift bolts, as a result of the heads breaking off or the claw bar slipping.

Apply Hot Creosote and Pitch

By G. D. Wall, Jr.
Assistant Engineer, Chesapeake & Ohio, Richmond, Va.

When a treated pile is cut off, it loses a large part of the benefit which comes from the preservative treatment, owing to the fact that the treating solution seldom penetrates a sufficient depth to protect the center of the pile which is exposed at the cut-off. The result is that, unless properly protected by other means, water, decay producing organisms, etc., may enter the wood with little or no hindrance.

Within the knowledge of the writer, several methods of providing this protection have been used with satisfactory results. In the first method, two coats of hot creosote and one coat of pitch are applied to the exposed surface and the top of the pile is then covered with a metal cap or some other suitable material. In the second method, the exposed surface of the pile is painted with a coat of dependable wood preservative, after which a coat of roofing cement is applied and the surface is covered with metal, roofing felt or similar material. The third method is to simply paint the exposed top of the pile with a recognized brand of wood preservative and then cap it with suitable material.

The first method is the most expensive and the latter is the cheapest. In the opinion of the writer, the proper protection of the exposed surface of the pile is so important that, within ordinary limits, no expense should be spared in providing a complete and dependable protection, so far as is possible. No chain is stronger than its weakest link, and the value of a treated pile is seriously affected unless all exposed surfaces are given the best possible protection.

Top Should Be Sealed Against Moisture

By L. C. Stahl
Assistant Engineer, Central of Georgia, Columbus, Ga.

After the pile has been cut off, the top should be given several coats of hot creosote and after this has been absorbed, a coat of asphalt roofing pitch should be applied, to a thickness of about ¼ in. A piece of heavy prepared roofing should then be cut about 2 in. larger than the diameter of the pile and placed over the top. If these applications are made properly, they will effectively seal the top of the pile against the entrance of moisture. The use of the asphalt roofing material between the top of the pile and the roofing will seal any slight openings which may occur around the edges of the drift bolts.

Installing Tie Plates

When installing ties, should tie plates be applied before or after tamping? Why?

Should Be Installed After Tamping

By J. A. Spurlock
Roadmaster, Missouri-Kansas-Texas, New Franklin, Mo.

If the ties are being renewed without a general raise being given to the track, then the ties should be tamped before the plates are applied. There are two reasons for this: In the first place, in spotting in ties without raising the track, it is almost always necessary to disturb the old bed, so that it is practically impossible to tamp the new tie solidly enough to prevent a slight settlement almost immediately, and in some types of ballast considerable settlement may take place. Under these conditions, if the plate is applied before the tie is tamped, it nearly always gets loose and rattles within a few days after its installation; in addition, abrasion and cutting of the spike by the plate nearly always occur. The second reason is that, if the plate is applied after the tie is tamped, the track can be lifted sufficiently to permit inserting the plate between the tie and the rail, and it is not necessary to nip the tie in order to drive the spike. Furthermore, the thickness of the plate will ordinarily take care of such settlement as occurs in the tie as a result of the disturbance of the old bed.

This method of making the installation causes the

track to ride somewhat rough under the first three or four trains. By this time the ties will obtain their settlement, however, the track will ride smoothly and the tie plates will not get loose and rattle.

It Is Better to Tamp First

By G. W. Evans
Section Foreman, Missouri-Kansas-Texas, Elgin, Texas

Where the method of tie renewal requires that the old bed shall be dug out, the ties should be very thoroughly tamped before the tie plates are applied, in order to allow for settlement of the tie in the loose ballast, since no amount of tamping will support the tie as well as the old bed which was disturbed. Furthermore, many of the tie plates now in use have corrugated bottoms which permit a settlement of the plate into the tie, ranging from $\frac{1}{8}$ in. to $\frac{3}{16}$ in. For these reasons, a better job and smoother riding track will be obtained if the new ties are well tamped in advance of the passage of any train over the track which is being worked on.

If the track is being surfaced or raised three inches or more at the time the tie renewals are being made, it is then satisfactory to install the plates before the ties are tamped, since the track should settle uniformly if a good job of tamping has been done.

Depends on the Kind of Ballast

By J. F. Peterman
Yard Foreman, Minneapolis, St. Paul & Sault Ste. Marie, Superior, Wis.

Where the ties are installed by spotting them in, in the ordinary process of tie renewal, a shim, about $\frac{1}{4}$ in. thick, should be placed between the rail and the tie, after which the tie should be well tamped. The tie plate should then be inserted after the rail has been lifted with a jack. This method will seat the tie firmly on its bed without disturbing the general surface of the track. This method can be used for all thicknesses of plates not exceeding $\frac{3}{4}$ in. thick. If heavier plates are used, a thicker shim should be placed between the tie and the rail before the tamping is done.

Where the ties are being renewed in rock ballast, or where the track is being given a general surface in connection with the tie renewal, the tie plate should be placed and full spiked before the ties are tamped. In either of these cases, if the tie plates are installed after the ties are tamped rough track will certainly result.

Should Generally Be Applied After Tamping

By H. D. Henninger
Section Foreman, Minneapolis, St. Paul & Sault Ste. Marie, Moose Lake, Minn.

The answer to this question depends largely on the kind of ballast and the method of making the installation of the ties. Where the ties are spotted, in any ballast other than crushed rock, the plate should be installed after the ties are fully tamped, for the old bed is usually broken down and considerable settlement of the new tie occurs. For this reason, the new ties become loose and afford very little support to the rail. In order to overcome this condition, the new tie should be tamped tight against the rail and one or two trains allowed to pass over the track before the plates are inserted.

If the ties are being renewed in connection with a ballast operation or a general surfacing of the track, the plates should be installed before the ties are tamped for the reason that all of the ties, both old and new, are likely to have a uniform amount of settlement, in which case there is no advantage in waiting until the settlement has taken place before the tie plates are inserted.

In my opinion the settlement of newly installed ties in rock ballast is not sufficient to warrant the tamping of the tie before the plates are installed. In this type of ballast, the bed is not as badly broken up in the process of renewing the ties as it is in other types of ballast and, consequently, the settlement is far less.

Removing Old Paint

When repainting a frame building, to what extent should the old paint be removed? How should this be done?

Scraping Loose Paint Is Sufficient

By H. J. Barclay
Assistant Supervisor Bridges and Buildings, Illinois Central, Carbondale, Ill.

In discussing the best methods of preparing the surface of frame buildings for repainting, it is assumed that the question refers to railway buildings and particularly to passenger stations or other structures with which the public is most likely to come in contact. Furthermore, under ordinary conditions, before a building requires much attention in the way of scaling or otherwise removing any amount of the old paint, it probably will be an old building that has been painted and repainted a number of times. Again the quality of the paint that has been used in applying the earlier coats will affect the amount of cleaning which may be necessary.

The common practice is to remove all loose and blistered paint with a scraper or putty knife. This avoids the possibility of the new paint peeling off at a later date, as it exposes the clean surface below the loose areas and the fresh paint will adhere to the exposed wood. To "skin" a building, or remove paint that adheres properly, does as much or more harm than binding it with oily paint. Where this practice is followed, it is almost impossible to avoid scarring the surface by digging too deep.

I am not in favor of burning the paint off with a blow torch, as is done so frequently. This is not only expensive but is also hazardous because of the possibility of fire. In my work I rarely permit this method to be used, except on small surfaces, such as front doors, signs, etc.

Gas Blow Torch Is Most Effective

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Wynne, Ark.

Only that part of the old paint which is checked or blistered needs to be removed. It is neither necessary nor desirable to disturb the old paint on frame buildings where it adheres tightly and has a smooth surface. When using this method, it is important that the surfaces from which the paint has been removed shall be thoroughly cleaned and then spot-painted heavily. For this purpose a large amount of turpentine should be used as a thinner for the priming coat, for the reason that the turpentine will soften

the exposed fibers of the wood and thus insure that the paint will stick to the surface. In my experience I have found that the gas blow torch is the most effective method of removing the old paint. The work should be done by men who are experienced in this class of work, however, in order to avoid the possibility of damaging the surface or of starting a fire in the building.

Diesel and Semi-Diesel Engines

What are the relative advantages of Diesel and semi-Diesel engines for pumping water, and under what conditions should each be used?

Selection Depends Upon Duty Requirements

By Engineer of Water Service

The true Diesel engine differs from the so-called semi-Diesel type in that it operates under higher compression, and ignition takes place from the heat generated by the high compression. Initial ignition is accomplished through the use of auxiliary air compressor equipment. The oil is injected in liquid form in the so-called semi-Diesel or low compression type of engine, ignition being accomplished by means of a tube or hot ball preheated by a torch.

The horsepower required is the principal factor governing the conditions under which each type should be used. As a rule, the true Diesel is rarely constructed in sizes less than 40 hp., although they have been built for special requirements in units as low as 20 hp. The power units used in the majority of railway pumping stations are less than 40 hp., and for this reason the true Diesel type of engine has not been used extensively, although in recent years a number of installations have been made on railroads.

The principal reason for using true Diesel engines in preference to the semi-Diesel type is the relative fuel economy they demonstrate, as in actual practice they will use approximately 0.5 lb. of fuel per hp. hr., as compared with an average of 0.8 lb. for the so-called semi-Diesel type. The manufacturers' guarantees as to actual fuel consumption as a rule are lower than the figures given above. The cost of true Diesel engines is, of course, greater than that of the so-called semi-Diesel type, this difference in cost being particularly apparent in the smaller sizes of the former type. While the economy in fuel consumption is of considerable importance in large units of 100 hp. and over, the total amount of fuel consumed in the small units which are now commonly used in the average railway pumping station is not great. For this reason, any saving of this character which might result from the use of the true Diesel, as compared with the so-called semi-Diesel type probably would be partially, if not wholly, offset by the increased cost of installation.

Both Are Reliable and Dependable

By R. C. Bardwell
Superintendent of Water Supply, Chesapeake & Ohio, Richmond, Va.

It is doubtful if Diesel and semi-Diesel engines can be considered competitive for power at railway water stations. The smallest practicable size of Diesel engine in railway service appears to be about 40 hp. and the largest of the modern semi-Diesel type will not exceed 30 hp. The term "semi-Diesel" applies to those engines in which the ignition is started by the external application of heat to a hot bulb or similar appliance, after which the ignition is continued by the heat of compression. The Diesel type refers to those engines in which the ignition is accomplished entirely by the heat of compression. With this type it is necessary that the construction be considerably heavier, as the compression must be sufficient to cause the ignition of the fuel charge, and the extra expense for the heavier construction does not appear to be warranted in engines of the smaller horsepower.

The chief advantage of using Diesel or semi-Diesel engines in railway water service is the reliability and dependability of such equipment, together with low operating costs and the small amount of maintenance required. Experience has indicated that the actual operating cost of this heavy oil engine equipment is about equivalent to electric power at 0.5 cents per kw. hr. The first cost of such engines is high, but the depreciation is low, which is an advantage where the water station is in a reasonably permanent location and provision has been made in the size of the power unit to provide for future development. The absence of intricate parts usually connected with internal combustion engine ignition by electric spark, together with sturdy construction and simple operation, afford further advantages, particularly with the type of operator usually engaged to handle such equipment.

The use of this equipment is desirable when the economy effected by low cost of power justifies the expense of installing it.

Unloading Ties

A further answer to the following question which was discussed in the April issue.

How should a section gang of from six to eight men be organized in unloading ties, from the standpoint of efficiency and safety?

Safety Is the First Consideration

By W. E. Connell
Roadmaster, Panhandle & Santa Fe, Pampa, Texas

In unloading ties from stock or box cars, the first consideration is safety and the second is efficiency. Not more than two men should be allowed to break into a car, since there is not safe room for more. These men should remove a sufficient number of ties, probably about 100, to give a clear working space. It is then satisfactory to put in one or two additional men, but this number should never exceed four in these types of cars since any additional men increase the danger of accidents.

If a gang consists of six or eight men, two men should be used on the ground to straighten up the ties and throw them clear so that they will not interfere with train movement.

As soon as the space at the door will permit, a tie should be placed crosswise in the door and used to allow ties to roll free so that they can be thrown endwise out of the car. Unloading in this manner requires less effort, aids in safety, prevents the scarring or bruising of the ties from contact between the car and ballast shoulder, and lessens the ground work materially.

A gang of 6 men, placed two to the car, with the proper system of handling the ties, will unload substantially as many ties, with less damage or chance of personal injury, as 10 to 12 men will do if placed four or more to the car.

New And Improved Devices

Buda Improves Ratchet Jack

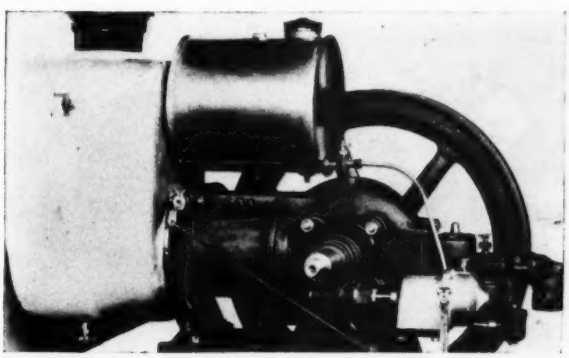
THE Buda Company, Harvey, Ill., has recently placed on the market a new ratchet jack which it has designated as No. 615 and which embodies several important improvements over the No. 6 jack of this company, which it replaces. The new jack, which is designed for heavy section or extra gang service, has a capacity of 15 tons, is double acting and is 31 in. high, with a 20.5-in. rise. By reason of improvements in construction and in the quality of material and a reduction in the number of parts, the weight of the jack has been reduced to 88 lb. The lever sockets are cast integral with the side plates and are made of heat-treated, electric cast steel. It is said that the possibility of an operator mashing his fingers between the top of the rack and the frame has been obviated by placing the stop for the rack bar in the base of the jack.

The New Buda No. 615 Ratchet Jack

A New Governor for Track Mowing Machines

FAIRMONT Railway Motors, Inc., Fairmont, Minn., has developed an engine known as Type QC for use on this company's M24 track mowing machine, which is identical with the Type QB engine that has been in use on Fairmont section and gang motor cars for five years, except that the new engine is equipped with a ball-bearing governor and the sliding base has been omitted. The governor is fully enclosed and the centrifugal fly-ball parts run in an oil bath, thus being protected from dust and grit. It is said that this type of governor has been used with marked success on railway pumping engines for five years.

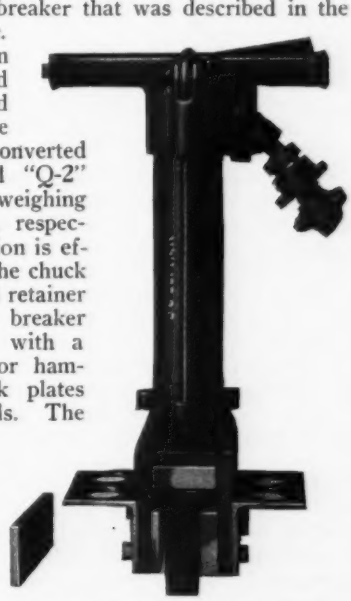
In addition to the engine, the M24 track mowing machines have been improved in various other ways as the desirability has become evident in actual service during 1928-29. Among these changes, the installation of endless-cord belts has been facilitated and the extension handwheels have been enlarged, while the strength and durability have been increased in several places. New parts are now designed to fit earlier machines as well as the later models.



The Fairmont Type QC Engine with the Flywheel and Timer Removed to Show the Governor

New Sullivan Pile Hammers

THE Sullivan Machinery Company, Chicago, has introduced a sheet pile hammer which is an adaptation of its concrete breaker that was described in the March, 1929, issue. By the substitution of certain front end parts the "K-2" and "K-4" concrete breakers may be converted into the "Q-1" and "Q-2" sheet pile drivers weighing 104 lb. and 112 lb. respectively. The conversion is effected by removing the chuck housing and the steel retainer from the concrete breaker and replacing them with a special anvil block or hammer, a guide, cheek plates and special side rods. The "K-4" concrete breaker has an anvil block which also must be removed.



Sullivan "Q-1" Pile Hammer

The guide is a heavy steel casting, machined to fit the front end of the cylinder and buffer ring, and is provided with two sets of lugs at right angles to each other, to one of which the side rods are secured. These lugs permit the guide to be attached to the tool so that the slot for receiving the sheeting may be either parallel or at right angles to the handles of the tool. The step plates, bolted to each

side of the guide to provide a convenient foothold for the operator, are of heavy angle irons. The cheek plates are fastened in place by screws and in order that sheet piling from 2 to 3 in. in thickness may be handled, they are furnished in various thicknesses. For example, the machine is usually assembled to take 2½-in. piling, and to drive 3-in. material one of the cheek plates is removed.

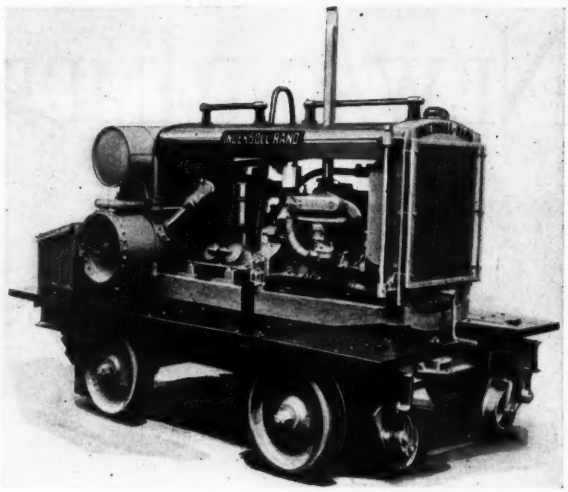
Changes Made in I-R Tie Tamping Equipment

A NUMBER of important changes and improvements have been made in Ingersoll-Rand tie tamping equipment, both in the different sizes of air compressors and in the tamping tools themselves. In the 4, 8 and 16-tool compressors of both the standard and self-propelled types, five major improvements have been made, which include the substitution of cast wheels with chilled treads for the pressed wheels used formerly; the adoption of an improved type of engine unloader, which is positive in action and which does not require attention; the provision of two side stake holders on each of the running boards, with stakes, to make it possible to carry track tools and the transverse rails used in removing the compressors from the track, without danger of them falling off; the addition of an aftercooler, consisting of a coil of pipes mounted directly above the air reservoir, to cool the compressed air as it leaves the reservoir and is fed to the hose lines; and the addition of four hand-gripping rods, two in a horizontal position longitudinally along the center of the top of the compressor housing, and two vertically, along each side of the engine radiator. A further feature in connection with these latter rods is the provision of metal fan guards on each side of the radiator fan, to prevent the possibility of injury to one using the vertical hand rods in mounting the compressor.

The New MT-2 Tamper with the Cross-Bar Handle

The tamping tool used with the different capacity compressors has also been redesigned in many details to make it more efficient and easy of operation, and is known as the MT-2 tamper. In the first place, the body of the tool has been shortened 6½ in., and the tamping steel, or bar, has been lengthened 3½ in. This has resulted in a slight reduction in the weight of the tool and, at the same time, provides increased clearance for the tool when tamping in congested areas around frogs and switches.

A distinctly new feature of the tool is the provision made for inserting a cross-bar handle through either the top or bottom of the upper spade-grip handle, by milling holes through the sides of the handle. The cross-bar handle furnished consists essentially of two rubber-covered grips, which are fastened to the spade handle by means of a long bolt which extends through the core of the grips and the spade handle. Other features in the new model tamper include the location of the air throttle at a point on the front of the tool, just below the upper spade grip; the provision of two air hose connections, one on each side, whereby connection can be made to the tool on the side which will cause the least interference of the hose with the operator; and certain improvements made in the method of exhausting air from the tool, which overcome freezing near the air exhaust port when the tool is operated in cool weather.

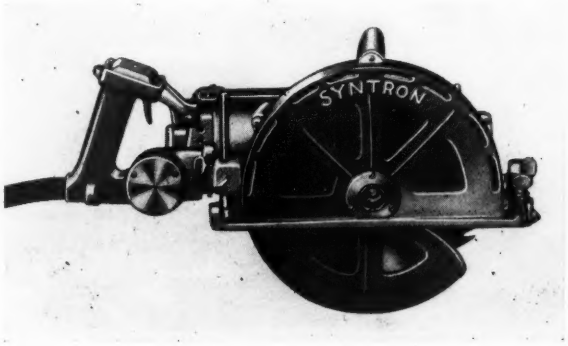


The Four-Tool Compressor Embodying the New Improvements

Syntron Develops New Portable Power Saws

THREE new models of portable electric saws have recently been added to the line of electric tools of the Syntron Company, Pittsburgh, Pa. These saws are said to be exceptionally light in weight, well balanced and have a surplus of power to meet the most difficult service. The models are distinguished from each other by the depth of the cut, this being 2 in., 3 in. and 4 in. for the three models. A standard safety switch is incorporated in the handle of each saw, which closes the circuit only while the trigger switch is depressed. There is also a safety switch to provide protection for the operator.

The saw blade of each model is completely enclosed in a circular housing which affords full protec-

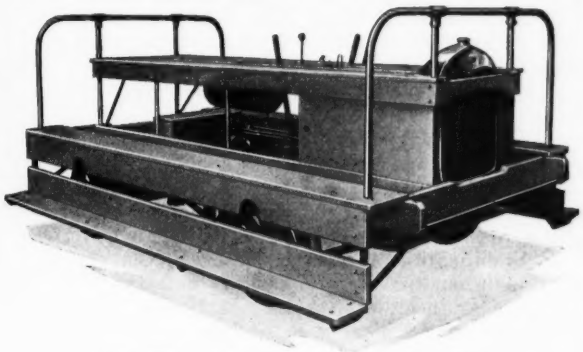


The New Saws Are Completely Enclosed

tion against injury. The base plate of the saw is adjustable for the various depths of cut and has a tilting feature in order that angles up to 45 deg. may be cut. Work for which these saws were designed includes bridge and building work and the cutting of hard materials such as fiber or lead sheeting.

Two New Heavy-Duty Motor Cars

THE Kalamazoo Railway Supply Company, Kalamazoo, Mich., has developed two new motor cars, designated as Models 38 and 39, which are powered with the standard Ford Model "A" engine. These cars are designed for heavy-duty service, such as hauling extra gangs, weed mowers, air compressors and heavily loaded trailers. The essential difference

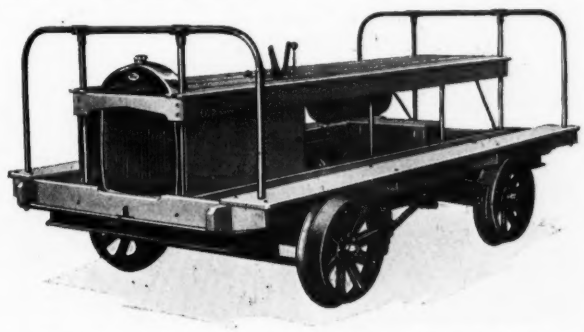


The New Kalamazoo No. 39 Motor Car

in the two cars is a side step or foot rest, which is attached to each side of Model 39 but is omitted from Model 38, thereby allowing the former a seating capacity of 28 men while the latter seats but 14 men. In addition to the Ford motor, other Ford equipment which is standard includes a starter, generator and battery and ignition, while lights are furnished on request.

The cars are also equipped with the Ford Model "A" transmission and clutch, and equal speeds in both directions are provided by the Kalamazoo reverse transmission. In order to equalize the strain on the reverse transmission, the power is transmitted to the rear axle by means of two heavy roller chains, one on each side of the transmission case. It is claimed that this feature insures longer life for the transmission and chains.

The wood parts of the cars are constructed from well-seasoned material and are rigidly supported and braced. Ample space for tools and other equipment



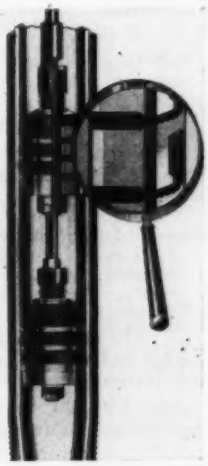
The No. 38 Is the Same as the No. 39, Except That It Is Without Side Steps

is provided by large tool trays on each side of the car and under the top seat. The main frame is constructed of standard three-inch steel channels and is riveted and welded at all joints. Ample brake power is provided by adjustable-toggle, lever brakes acting on all four wheels, and the brake blocks are equipped with replaceable cast iron shoes. The axle boxes are carried on coil springs and the bearings consist of Bower roller axle bearings with hardened and ground rollers and races.

The dimensions common to both cars are as follows: Overall length, 123 in.; length of seat, 113 in.; width of seat, 30 in.; height from top of rail to seat, 40⅜ in.; height from top of rail to footboards over wheels, 23⅜ in.; and height from top of rail to top of safety rail, 52⅜ in. The overall width of the Model 38 is 70 in., while that of the Model 39 is 84 in., and the weights are 1,850 and 2,100 lb., respectively.

New Spacing Ring Adds Service to Cup Leathers

A NEW design of cup leather spacing ring has been developed by A. D. Cook, Inc., Lawrenceburg, Ind., for use in the valves of plunger pumps, which is said to increase the life of cup leathers from three to five times. The important feature of the new design is the modification of the seat for the cup leather to form a support for all of the leather except its straight or vertical wall. In addition, the cup leather is given an obtuse angle instead of a right angle so that when new the leather does not lie flush with the wall of the barrel but approaches it at a small angle and engages it only at the top of the leather, which flares slightly outward. With this design it is said that there is less likelihood of tearing or breaking the fibers of the cup leather and that the wear progresses from the top, where the lip comes in contact with the wall of the barrel. It is said further that this wear takes place only on the upstroke when the pressure is from within, and that there is no friction or wear during the downstroke because the cup leather does not engage the working barrel. This reduced friction on the downstroke is claimed to lessen the tendency of the pump rods to buckle in compression.



The Cup Leathers and Spacing Rings, Assembled

The results of tests using the new spacing rings, which were conducted in wells carrying large quantities of sand but without deep well strainers to hold it back, indicate that the life of cup leathers is increased considerably. In one well with a 5-in. working barrel and a head of 210 ft., it is reported that the service of the new design of cup leathers was 28 months, whereas the best previous service had been 9 months. In another well with an 8-in. working barrel and a head of 110 ft., which pumped sand the size of wheat continually, it is said that the new cup leathers were only about one-tenth worn after 11 months, while the best previous service had been 6 months.

New Books

Proceedings of the American Railway Bridge and Building Association. Edited by C. A. Lichty, secretary of the association. 254 pages, illustrated, 6 in. by 9 in., cloth. Published by the association, 319 North Waller avenue, Chicago.

This volume contains the complete report of the thirty-ninth annual convention of the association, which was held at New Orleans, La., on October 15 to 17, 1929. As in previous years, the contents comprise, primarily, the eight committee reports which were presented at the convention, together with the discussions which followed their presentation. The reports last year dealt with the following subjects: Selecting and Training Foremen; Reducing the Cost of Maintaining Buildings; The Relative Economy of Concrete Mixes; Water Transport Facilities; The Elimination of Accidents; The Protection of Underground Pipe Lines; The Inspection and Maintenance of Track Scales; and Wearing Surfaces for Platforms. In addition, a paper was presented by H. I. Benjamin, assistant engineer of bridges, Southern Pacific, on The Construction of the Suisun Bay bridge. There were also included addresses by R. C. Watkins, vice-president and general manager, Southern Pacific Lines in Louisiana, on The Bridge Gang; by H. R. Safford, executive vice-president, Gulf Coast Lines, on New Factors in Railroading; by J. F. Carter, Southern Pine Association, on Grade Marking of Southern Pine; and B. R. Ellis, Southern Cypress Manufacturers' Association, on The Value and Use of Cypress.

Manual of the American Railway Engineering Association 1,531 pages, illustrated, 6 in. by 9 in. Bound in cloth and leather. Published by the association, E. H. Fritch, secretary, 59 East Van Buren street, Chicago. Price cloth, $6 to members, $10 to non-members; half morocco, $7 to members, $11 to non-members.

This is the sixth edition of the Manual and, while just issued, is dated 1929, since it contains matter accepted by the association only up to and including the 1929 convention. While the earlier editions were issued at maximum intervals of about five years, this is the first issue since 1921.

The Manual is a compilation of the standards of recommended practice of the association and presents those conclusions of the 24 standing and special committees which have been accepted by the association. It contains the results of intensive work over a period of 30 years by this association which is recognized as the most active and thorough of engineering societies. Because of the high standards which the association has set for itself and the care with which it scrutinizes the work of its committees, the Manual has become the recognized authority throughout the world on railway engineering and maintenance practices. Committee recommendations included in the Manual represent years of study of the subject.

As might be expected in a work of this character and magnitude, the Manual contains considerable obsolete material, an example of which is the recommended practice in rail renewal, which is based entirely on hand methods, whereas present practices involve the use of power machines for practically every rail-laying operation.

The matter in the Manual covers practically every phase of railway engineering and maintenance and many phases of operation. It can be subdivided into several classes: Definitions; specifications for materials and workmanship; standard practices in inspection, workmanship and the conduct of routine maintenance of way work on the railways; standard designs covering roadway, track, trackwork, structures, tools and other equipment; methods of keeping records and accounts; rules for the guidance of supervisory officers and employees in the engineering and maintenance of way departments; and miscellaneous data of value in maintenance of way practices.

Proceedings of the Roadmasters' and Maintenance of Way Association of America. 246 pages, illustrated, 6½ in. by 10 in. Bound in cloth. Published by the association, T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa.

This issue of the Proceedings comprises a complete report of the forty-seventh annual convention of the association, which was held at Chicago on September 17 to 19, 1929. It includes reports from committees on The Selection and Training of Foremen; The Correction of Unsafe Methods in Track Work; Weed Control and Elimination; Good Workmanship in Relaying Rail; and Controlling Cross and Switch Tie Renewals.

In addition, individual papers are included on Recent Developments in the Detection of Transverse Fissures in Rails, by C. W. Gennet, Jr.; on The Stabilization of Forces, by H. S. Clarke, engineer maintenance of way, Delaware & Hudson; on A New Day in Maintenance by R. H. Ford, assistant chief engineer, Chicago, Rock Island & Pacific; on The Production and Care of Crossties, by R. S. Belcher, manager treating plants, Atchison, Topeka & Santa Fe; and on Getting the Most from Labor Saving Equipment, by M. M. Backus, assistant chief engineer maintenance of way, Illinois Central. There are also included addresses by W. F. Thiehoff, general manager, Chicago, Burlington & Quincy, and L. A. Downs, president, Illinois Central. A valuable and interesting feature of the volume is the inclusion of the discussions which followed the presentation of the reports and papers.

Rail Yard of the Santa Fe Stores Department at San Bernardino, Cal.

WITH THE ASSOCIATIONS

Bridge and Building Association

President Huntoon and officers of the association and of the Supply Men's organization met at Louisville on Monday, April 28, to select the headquarters hotel and make other arrangements for the convention next fall.

Maintenance of Way Club of Chicago

The Maintenance of Way Club of Chicago held its last meeting for the season on April 16, when 57 members and guests were present to hear C. E. Cox, chief engineer of the Chicago Union Station Company, give a talk on the organization, methods and equipment employed by the station company in meeting the emergency of severe blizzards. This talk is published on a preceding page in this issue. The next meeting will be held in October.

International Track Supervisors' Club

The next meeting of the International Track Supervisors' Club will be held on May 8, at the Hotel Statler, Buffalo, N. Y., immediately following a noon-day luncheon, which will be served at 12:30 p. m., eastern standard time. At that meeting the following papers will be read and discussed: "The Mole Ballast Cleaning Machine," by J. W. Powers, supervisor, New York Central; and "The Oiling of Curves to Prevent Flange Wear," by W. H. B. Bevan, assistant district engineer, Canadian National.

Roadmasters' Association

President E. E. Crowley has appointed as a committee to select the convention city for 1931, Vice-Presidents Elmer T. Howson and C. W. Baldridge, Past President H. R. Clarke and President L. P. Shanahan and Secretary L. C. Ryan of the Track Supply Association. This committee is charged with the responsibility of investigating hotel facilities and recommending a convention city at the annual meeting next September.

President Crowley has appointed as an arrangements committee for the next annual convention J. J. Desmond, I. C.; A. Chinn, C. & A.; A. H. Told, Positive Rail Anchor Company, and L. C. Ryan, Oxweld Railroad Service Company.

American Railway Engineering Association

Secretary E. H. Fritch and his staff have moved into their new quarters on the twenty-second floor of the Buckingham Building, 59 East Van Buren street, Chicago, where improved facilities are available for them jointly with the American Railway Association.

The committees are now actively engaged in their work for the new year. Among those which met during the last month are the committees on Economics of Railway Location, at New York on April 4; Yards and Terminals, at Buffalo on April 7; Water Service, at Chicago an April 22; Track, at Toronto on April 28-29, and Clearances, at New York on April 29. Other committees are scheduled to meet during May as follows: Iron and Steel Structures, at Cincinnati on May 8-9; Ballast, at Washington, D. C., on May 8; Masonry, at Chicago on May 12-13; Records and Accounts, at Washington, D. C., on May 13, and Work Equipment, at Chicago on the same date.

Secretary Fritch has received 2,000 ft. of additional motion picture films showing the practices on the South Manchuria and Korean railways, bringing the total collection of films of these and the Japanese railways to 10,000 ft. Much interest is being shown in these films, which are available for use by colleges and other educational organizations.

Metropolitan Track Supervisors' Club

The last meeting of the Metropolitan Track Supervisors' Club was held on April 10, at Keen's Chop House, 72 West Thirty-sixth street, New York, with 48 members and guests present. The two main features of the meeting were the presentation of a paper on "The Selection and Qualifications for a Track Foreman" and an address by Samuel Baker, director of the schools of civil, structural and concrete engineering of the International Correspondence Schools, Scranton, Pa. The next meeting of the club will be its annual outing, to be held on June 14, at Dorlon's Point, East Norwalk, Conn.

Directory of Associations

American Railway Bridge and Building Association—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 21-23, 1930, Louisville, Ky.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, March 10-12, 1931, Palmer House, Chicago.

American Wood-Preservers' Association, H. L. Dawson, secretary, Washington, D. C. Next convention, January 27-29, 1931, Philadelphia, Pa.

Bridge and Building Supply Men's Association—W. H. Lawrence, secretary, Johns-Manville Corporation, 41st street and Madison avenue, New York. Annual exhibit at convention of American Railway Bridge and Building Association.

National Association of Railroad Tie Producers—Roy M. Edmonds, secretary, Syndicate Trust Building, St. Louis, Mo.

National Railway Appliances Association.—C. W. Kelly, secretary, 1014 South Michigan avenue, Chicago. Annual exhibit during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 16-18, 1930, Chicago.

Track Supply Association—L. C. Ryan, secretary, Oxweld Railroad Service Company, Chicago. Annual exhibit at convention of Roadmasters' and Maintenance of Way Association.

Caterpillar Tractor with Double-Drum Winch and Dragline Bucket Cleaning Out a 500-ft. Culvert

RAILWAY NEWS BRIEFLY TOLD

The Parker bill, which provides for a system of regulation of motor carriers engaged in the transportation of persons in interstate and foreign commerce by the Interstate Commerce Commission with the assistance of joint boards of state representatives, was passed by the House of Representatives on March 24. The prospects for the bill in the Senate are uncertain but its friends are hopeful that it may be passed during this session.

The Southern Pacific has established an employment clearing house system, through which, so far as possible, employees temporarily laid off in one occupation or locality will be re-employed by the railroad in other work or in another place. The plan is intended to stabilize forces and to avoid the dropping of employees through seasonal fluctuations in business and the varying demands of maintenance and improvement work.

The National Air Transport, which now carries air mail and air express between New York and Chicago, and between Chicago and Dallas, Tex., expects to begin this summer the operation of passenger airplanes between these points. The service will involve the use of airplanes capable of maintaining a cruising speed of 140 miles an hour, which will enable passengers to be transported from Manhattan Island to Chicago in 6 hr. and 50 min., and from that point to Dallas in 8 hr.

Foremen in the maintenance of way department of the Kansas City Southern, in whose gangs no reportable personal injuries occurred during 1929, were recently presented with 100 per cent safety cards. The cards carry the name and headquarters of the foreman and also the following words: "In recognition of the faithful discharge of his personal responsibility for the safety of his men during the twelve months ending December 31, 1929." They are signed by the supervisor of safety and the chief engineer.

At the end of 1929, a total of 8,811 employees of the Missouri Pacific had taken advantage of the group insurance plan provided by this road and on March 1, 1930, 925 employees were on the pension roll. Premiums on a total of $18,777,000 of life insurance in effect in 1929 amounted to $306,475 and the claims paid during the year totaled $283,002, while at present the monthly pension roll is $53,673. Any employee who reaches the age of 70 years is automatically retired, while employees who have been in the service of the company continuously for 25 years and who have given their entire time on the regular tour of duty can be pensioned.

Payments for freight loss and damage, as reported by 180 carriers representing 95 per cent of the railroad mileage of the United States and 60 per cent of the mileage in Canada, increased from $36,557,243 in 1928 to $37,432,966 in 1929, an increase of $875,723 or 2.4 per cent, although a decrease of 22.2 per cent under 1922. Fresh fruits, melons and vegetables were responsible for 27.8 per cent of the total payments, while live stock took 7.4 per cent, new furniture 5.5 per cent and automobiles 4.2 per cent.

The Senate, on April 11, passed a bill appropriating $9,239,963 for the work of the Interstate Commerce Commission for the fiscal year ending June 30, 1931, which was an increase of $1,007,313 over the same bill passed by the House, as announced in the March issue. The increase was provided by an amendment of the House bill, which increased the amount for valuation from $2,540,000 to $3,547,313, the amount originally recommended by the Bureau of the Budget but reduced by the House.

The Public Utilities Commission of Ohio, in dismissing a complaint against the Wheeling & Lake Erie, has ruled that railroads are not required to employ full crews on electrically-operated railroad coaches. The commission held that the cars, although propelled by gasoline motors driving electric dynamos, come within the classification of electric cars and, therefore, are not subject to the full-crew law. The complaint had been filed by the Brotherhood of Locomotive Firemen and Enginemen, which alleged that the W. & L. E. had violated the law in the operation of gas-electric rail cars.

Holdings of the Allegheny Corporation, which is controlled by the Van Sweringen interests, and of the Pennroad Corporation, which was organized by officers of the Pennsylvania, were revealed in detail by Commissioner Joseph B. Eastman of the Interstate Commerce Commission at a hearing on April 5 before the House committee on interstate and foreign commerce, which marked the beginning of an investigation by the committee on the ownership of railway securities by holding companies, investment trusts and others. The investigation, to which the committee is planning to devote a year or more, is being held with a view to possible legislation to bring holding companies within the regulatory powers of the commission.

Senator Couzens of Michigan, chairman of the Senate Committee on Interstate Commerce, on April 1, introduced in the Senate a resolution to suspend the authority of the Interstate Commerce Commission under existing law to approve any consolidation or unification of railroad properties in any form until "such time as Congress shall enact adequate legislation properly designed to protect and promote the public interest." The resolution evidently is intended also as an effort to put a stop to activities toward acquisition of control of various roads, by declaring unlawful any consolidation or unification of railroad properties, whether directly by consolidation, merger, lease or purchase, or indirectly through the device of a holding company or in any other manner, without the approval of the commission.

Employee Casualties in 1929

The National Safety Council, preliminary to making its awards to the railways with the best safety records in 1929, has selected, from preliminary statistics, the following roads for consideration:

Rank	Railroad	Casualties per Million Man-Hours
	Group A (100 Billion Man-Hours or More)	
1	U. P. System	2.48
2	Penna. Central Region	7.72
3	Southern System	7.98
	Group B (50-100 Billion Man-Hours)	
1	U. P. Co.	2.01
2	A. C. L.	7.38
3	C. C. C. & St. L.	8.73
	Group C (20-50 Billion Man-Hours)	
1	O.-W. R. R. & N.	2.65
2	O. S. L.	2 71
3	Wabash System	7.59
	Group D (10 20 Billion Man-Hours)	
1	L. A. & S. L.	3.96
2	C. G. W.	4.18
3	K. C. S.	5.17
	Group E (5-10 Billion Man-Hours)	
1	G. M. & N.	1.68
2	D. M. & N.	3.56
3	B. & L. E.	10.00
	Group F (2-5 Billion Man-Hours)	
1	D. & I. R.	2.78
2	S. I. R. T.	3.26
3	Ann Arbor	5.62

Construction News

Projects Contemplated

Abilene & Sou.—I. C. C. examiner's report recommends approval of line, San Angelo, Tex.—Ballinger, 39 miles.

C. P. R.—Branch line Quebec, Que., to connect trackage with new harbor facilities; also improvements and construction of branch lines on Western lines during 1930, $21,000,000.

Nat. of Mex.—Construction of new line, Uruapan, Micho.—Zihuantanejo, Gro., 170 miles.

N. & W.—Steel blacksmith shop, Roanoke, Va., 637 ft. by 100 ft.

Ore. Electric—I. C. C. approval asked for construction 30-mile line Eugene, Ore., to Lane county and 10-mile branch.

Penna.—Reached agreement with Chicago city council committee for elevation of line between 58th and 59th sts. and Morgan st., 8,000 ft., $3,000,000. In co-operation with several other roads to eliminate grade crossings, Louisville, Ky., $5,000,000.

S. P.—Immediate construction of brick passenger and freight station, Stockton, Cal., $200,000.

S. L.-S. F.—I. C. C. approval asked to construct 2.95-mile extension, Shamrock, Okla.—Drumright; also for new line, Cameron, Okla., 5.83 miles.

Wab.—Two-story freight house, 95 ft. by 195 ft., Chicago, $60,000. Grain elevator, 2,000,000 bu. capacity, Omaha, Neb., $500,000.

W. P.—I. C. C. approval asked for construction 4.7-mile extension, Stockton, Cal.

Approved by Commissions

C. P. R.—By House of Commons committee to construct branch lines: Tempest, Alta., 10 miles; Dunelm, Sask., southwest, 55 miles; Duval, Sask., east, 25 miles; Battleford, Sask., to Shellbrook, 70 miles.

C. & O.—By I. C. C., to construct extension to Cabin branch, Edwight, W. Va., to Surveyor, 19.2 miles, $2,377,470.

Clinton-Okla. West.—Subsidiary of A. T. & S. F. by I. C. C. to construct line from Heaton, Tex., north, 8.7 miles.

M. P.—By War Department, to reconstruct bridge, Ouachita river, Arkadelphia, Ark.

N. Y. C.-Erie—By Pub. Serv. Com. of N. Y. to eliminate 17 grade crossings, Dunkirk.

S. P.—By I. C. C. to construct 5.8-mile extension to Sandia branch of the Inter-California railway, Sandia, Cal.
By U. S. War Dept. to build a combined railway and highway bridge over Louisiana and Texas Intercostal waterway, Houma, La.

S. L.-S. F.—C. R. I. & P.—By I. C. C. through subsidiaries to construct 150 miles of lines in Texas; S. L.-S. F. & T. from Vernon to Seymour, 42 miles, and trackage rights over C. R. I. & G., Jacksboro to Ft. Worth, 71.6 miles; C. R. I. & G. from Shamrock to 5 miles north of Quanah, and from Quanah to connection with Vernon-Seymour line at Beaver Creek, 108 miles, and trackage rights over Vernon-Seymour line from Beaver Creek to Seymour and over G. T. & W. from Seymour to Jacksboro; S. L.-S. F. & T. also to have trackage rights over C. R. I. & G. from Quanah to Beaver creek.

Tex. Short Line—By I. C. C. to construct line, Grand Saline, Tex.—Van, 11 miles, $370,000.

Projects Authorized

C. & O.—Extension of 10 tracks in classification yard, Russell, Ky., $583,000; coal pier, Newport News, Va., $2,210,000; reconstruct bridge No. 4412, Winifrede Jct., W. Va., $84,500, reconstruct arch over Rush creek, Marmet, W. Va., $72,300; reconstruct arch over Lens creek, East Marmet, $85,500; changes in approaches bridge No. 4855, Milton, W. Va., $34,200; reconstruction approaches bridge No. 4916, Ona, W. Va., $25,000; water station, Robbins, Ohio, $52,900; improvements, Russell, Ky., to Parson, Ohio, $30,000; 150-car center siding, Omega Road, Ohio, $118,500.

C. & N. W.—Express terminal building, Chicago, $3,125,000.

N. Y. N. H. & H.—Additional main track, Kingston, R. I.—Davisville, 10.2 miles, $637,000; also Westerly, R. I.—Bradford, 4.7 miles; additional tracks in storage yard, New Haven, Conn., $55,000; improved coaling facilities, Waterbury, Conn., $55,000; platform renewals, Boston, Mass., $25,000.

N. & W.—Brick and concrete warehouse, 120 ft. by 650 ft., Lambert Point, Va., $100,000.

R. F. & P.—Construction of extensions to five passenger sidings, $102,000.

Bids Received

C. N. R.—For clearing, grading and culvert work for line, Swift, B. C.—Tete Jaune, 12 miles; also for replacement wood box culverts in B. C. with concrete culverts. May 15 for construction 2,500,000-bu. grain elevator, Churchill, Man. For fencing on Melfort-Aberdeen branch, Sask., 178 fence miles; clearing and installation of culverts for Bulwark Easterly branch, Sask., 25 miles.

C. M. St. P. & P.—Until April 28 for concrete and bridge work on Sections 6 and 7, 13 miles, joint line with C., R. I. & P., Polo, Mo., to Birmingham.

G. T. W.—For construction 3-story concrete and brick express and office building, Pontiac, Mich.

G. N.—For construction extension to enginehouse, Duluth, Minn., $85,000.

T. & P.—For construction concrete and steel passenger station and office building, 1-story brick warehouse and 8-story brick and concrete freight station, Ft. Worth, Tex., $4,000,000.

Tulsa Union Depot Co.—For construction union station, Tulsa, Okla., for A., T. & S. F., M.-K.-T. and S. L.-S. F., $1,500,000.

Contracts Awarded

Ann Arbor—One-story shop building, Owosso, Mich.—Walsh Construction Co., Chicago, $50,000.

A. T. & S. F.—23-miles second track, Winslow, Ariz., to Joseph City—Fellows Contr. Co., Los Angeles, Cal.

B. & O.—Track elevation at Irvine street, Pittsburgh, Pa.—Vang Const. Co., Cumberland, Md., $500,000; subway under tracks, Hazelwood, Pa.—Vang Const. Co., $250,000.

B. & A.-N. Y. N. H. & H.—Improvements to South station, Boston, Mass., including removal of train shed, erection of butterfly type shelters for platforms, closing in of concourse along line of present gates and improvements to concourse—Sawyer Const. Co., Boston, $1,500,000.

B. & M.—Reconstruction of bridges, Thorntons Ferry, N. H.; over Souhegan river, Merrimack, N. H.; over Nashua river, Nashua, N. H.; over Merrimack river, Goffs Falls, N. H.—New England Const. Co., Springfield, Mass., $150,000.

C. N. R.—Construction of 29-mile line Lulu Island, B. C.—Campbell Const. Co., Ltd., Calgary, Alta.

C. & O.—Wye track, White Oak Jct., W. Va., and extension yard tracks, Russell, Ky.—Haley, Chisholm & Morris, Charlottesville, Va., $81,000 and $53,700; 150 car-center sidings, Robbins, Ohio, and Marshall—Langhorne & Langhorne, Huntington, W. Va., $160,000 and $104,000; 358,000-gal. steel water tank, Hinton, W. Va.—Graver Corp., East Chicago, Ind., $40,000.

C. & N. W.—Clearing and grading for 5.6-mile extension Gogebic line, Michigan—Bonifas Lumber Co., Neenah, Wis.; alterations power house, California ave., Chicago—Harmon Engr. Co., Chicago, $30,000; substructures as part of 1930 program for bridge replacement, totaling $250,000 to Koss Const. Co., Des Moines, Iowa; the Jutton-Kelly Co., Milwaukee, Wis.; the Widell Co., Mankato, Minn.; the S. G. Cool Const. Co., Chicago; Peppard & Burrill, Minneapolis, Minn. Driving of foundation piles for 2,000,000-bu. addition to grain elevator, Milwaukee, Wis.—Edward E. Gillen Co., Milwaukee, $500,000.

C. M. St. P. & P.—Concrete and steel automobile dock, Green Bay, Wis.—Peppard & Fulton, Minneapolis, Minn., $250,000. For construction Sections 6 and 7, Moseby, Mo., to Birmingham, 13 miles, joint line with C. R. I. & P., Polo, Mo., to Birmingham—Peterson, Shirley & Gunther, Omaha, Neb.

C. R. I. & P.—Section 4, 7 miles, joint double-track line with C. M. St. P. & P., Polo, Mo., to Birmingham—Winston Bros. Co., Minneapolis, Minn.

Cin. Union Term.—Structural steel for C. N. O. & T. P. line, Cincinnati, Ohio—Mt. Vernon (Ohio) Bridge Co., $120,000.

D. & H.—Grade separation, Valcour, N. Y.—Spellman & Oliver, Chateaugay, N. Y., $90,000.

Erie—Two concrete bridges, over main highways, Lanesboro, Pa., and

over Canawacta creek—James S. McCormick, Easton, Pa.; 2,000-ton concrete coaling station, Susquehanna, Pa.—Roberts & Schaefer Co., Chicago; two-stall enginehouse, yard buildings and tracks, Akron, Ohio—Hecker-Moon Co., Cleveland, Ohio.

G. N.—Electric cinder plants, Williston, N. D., Brockton, Mont., Glasgow, Wagner and Helena—Roberts & Schaefer Co., Chicago; 3,000,000-bu. addition to grain elevator, Superior, Wis.—Burrell Engineering Co., Chicago; coal dock and sand house, Sand Point, Idaho—Minneapolis Steel & Machinery Co., Minneapolis, and Howlett Const. Co., Moline, Ill., $50,000.

G. C. & S. F.—Water lines, fire lines, gas lines and sanitary plumbing to serve freight house, Dallas, Tex.—J. B. Collins & Co., Houston, Tex.; similar facilities at new storehouse, Cleburne, Tex.—G. D. Harris & Co., Dallas, Tex.

M. P.—A 2,076,000-bu. addition to grain elevator, St. Louis, Mo.—Edwin Ahlskog, Chicago, $700,000; one-story concrete and stone passenger stations, Grays Summitt, Mo., Labadie and Boles—J. C. Duncan, St. Louis, Mo.

N. Y. C.—Pier shed, Wallabout Basin, Brooklyn, N. Y.—Miller-Blyth, Inc., N. Y.; yard buildings, Mott Haven, N. Y.;—Babor-Comeau & Co., Inc., N. Y.; reconstruction bridge T-5, Depew, N. Y.—William Franklin, Buffalo, N. Y. Grade separations: Schenectady, N. Y.—James E. Lowe & Sons, Inc., Schenectady; Relius, N. Y.—Walsh Const. Co., Syracuse, N. Y.; Poland, N. Y.—R. H. Beebe, Inc., Utica, N. Y.; Hannibal, N. Y.—I. M. Ludington's Sons, Inc., Rochester, N. Y.

N. Y. N. H. & H.—Overhead steel bridge, Jewett City, Conn.—M. A. Gammino Const. Co., Providence, R. I., $46,000; changes in dock facilities, Beacon, N. Y.—G. W. Rogers Const. Co., New York, $34,000.

N. & W.—Extension Jacob's Fork branch, 8 miles, Newhall, W. Va.—Walton Sudduth Co., Bluefield, W. Va., $1,250,000.

Nor. Alta.—Extension, Fairview, Alta., 15 miles west—Stewart, Grant & Mannix, Calgary, Alta.; also line, Hythe, Alta., to Rolla, 50 miles—Roosa & Wickstrand, Vermillion, Alta.

Penna.—Extension to produce house, Pittsburgh, Pa.—W. F. Trimble & Sons Co., Pittsburgh, $157,000; bridge over Shamokin creek, Sunbury, Pa.—George W. Rockwell, Sunbury, $100,000.

P. & L. E.—Electric engine coaler and cinder handling plant, Pittsburgh, Pa.—Roberts & Schaefer Co., Chicago.

S. P.—One-story brick and concrete passenger and freight station, Stockton, Cal.—Lewis & Green, San Francisco, Cal., $200,000.

Tulsa Union Depot—Lowering and reconstruction of tracks for new union station facilities, Tulsa, Okla.—Reid & Lowe, Birmingham, Ala.

U. P.—One-story concrete and brick passenger station, Fairbury, Neb.—Brown Engineering Co., Omaha, Neb., $90,000; one-story passenger station, 42 ft. by 162 ft., Greeley, Colo.—Mead & Mount Const. Co., Denver, Colo., $100,000.

Supply Trade News

General

The Lewis Asphalt Engineering Corporation has moved its Chicago office from 100 North La Salle street to 740 Rush street.

The Chicago Pneumatic Tool Company, New York, has opened a branch office in the Merchants and Manufacturers building, Houston, Tex.

The Reliance Manufacturing Company, Massillon, Ohio, has moved its Detroit, Mich., office from 650 Baltimore avenue, west, to 9771 French road.

The Lundie Engineering Corporation, on April 1, moved its Chicago office from 166 West Jackson boulevard to the Buckingham building, 59 East Van Buren street.

The Electric Railweld Sales Corporation, Chicago, has extended its service to include the reclamation of frogs, switches and crossings, in or out of track, for which it has created a new division in charge of **C. O. Hunt,** formerly shop superintendent of the Ramapo Ajax Corporation at Chicago.

The General Pneumatic Tool Corporation, Chicago, has been organized to sell spray painting equipment. **Mortimer Sullivan,** formerly vice-president and general manager of the Binks Spray Equipment Company, Chicago, has been elected president of the General Pneumatic Tool Corporation, and **Gerald Hale,** formerly sales manager of the Binks Spray Equipment Company, has been elected vice-president of the new company.

Personal

William Robertson, president of William Robertson and Company, Chicago, died on April 28, in the Ravenswood hospital in that city at the age of 63 years.

R. H. McGredy has been appointed representative of the **Harnischfeger Sales Corporation,** Milwaukee, Wis., with headquarters at 50 Church street, New York.

A. W. Daniels, general sales manager of the **American Manganese Steel Company,** Chicago Heights, Ill., has been elected vice-president in charge of sales.

A. H. Weston has resigned as manager, Reading Specialty division of the **American Chain Company,** and is now associated with the **Reliance Manufacturing Company,** Massillon, Ohio. Mr. Weston's headquarters will be at 258 Broadway, New York.

R. G. Elliott, 631 Chapel street, New Haven, Conn., has been appointed representative in the state of Connecticut of the **Reading Chain & Block Corporation,** Reading, Pa.

Joseph V. McMullan, district sales manager of the **Naylor Pipe Company,** Chicago, with headquarters at 3116 Chrysler building, New York, has also been appointed foreign sales manager.

William T. Kyle, general sales manager of the **Page Steel & Wire Company,** has resigned to become president of the **Welding Engineering and Research Corporation,** New York.

Morley S. Sloman, representative of the **Sullivan Machinery Company,** with headquarters at Pittsburgh, Pa., has been promoted to manager of the Huntington, W. Va., branch office, to succeed **John S. Walker, Jr.,** who has resigned to engage in banking at Huntington.

J. A. Leiendecker, pole line material specialist with the General Electric Supply Corporation, has resigned to go with the **National Lumber & Creosoting Company,** and will specialize in pole sales as well as other creosoted timber products in northern Texas and Oklahoma. Mr. Leiendecker's headquarters are at Dallas, Tex.

Samuel S. Demarest has become associated with the **Detroit Graphite Company,** Detroit, Mich., as manager of railway sales in the East, with headquarters in the Chrysler building, New York. Mr. Demarest was formerly eastern railway sales representative of **Pratt & Lambert, Inc.,** Buffalo, N. Y., and later vice-president and general manager of the **Charles R. Long, Jr., Company,** Louisville, Ky.

George F. Davie, vice-president and treasurer of the Interstate Iron & Steel Company, Chicago, died in that city on April 8 following an operation. He was born in Boston, Mass., on February 22, 1861, and entered business as a bookkeeper for an iron metal firm at the age of 18 years. From 1887 to 1905 he conducted a business of his own and in the latter year became one of the organizers of the Interstate Iron & Steel Company.

Charles Jenkinson, representative of the Rail Joint Company, with headquarters at Washington, D. C., died on March 24 at Chicago, at the age of 67 years, following a brief illness. Mr. Jenkinson began his career in Chicago and afterwards went with the Mobile Street Railway. He later served as inspector in southern territory for the Weber Railway Joint Manufacturing Company. In 1905, when the Weber Company merged with the Rail Joint Company, Mr. Jenkinson remained with the latter company and represented it in the South until his death.

Clarence H. Norwood, president of the Norwood-Noonan Company, designers of electrical drawbridge machinery, Chicago, died in that city on April 12 following a heart attack. He was born in San Francisco, Cal., in 1875, and until 1919 was associated with the sales department of the Union Iron Works, the Cutler-Hammer Manufac-

turing Company and the Commercial Electric Company. In 1919 he organized the Norwood-Noonan Company, of which he was president at the time of his death.

Robert J. Davidson, treasurer of the Ramapo Ajax Corporation, New York, died on April 3 at his winter home, Daytona Beach, Fla. Mr. Davidson was born on June 18, 1850, at Blooming Grove, Orange county, N. Y. In 1872 he was appointed shipping clerk of the Ramapo Wheel & Foundry Company and shortly afterwards he

Robert J. Davidson

was promoted to bookkeeper and later became correspondence clerk. In 1881 he was elected secretary of the Ramapo Iron Works Company, retaining also his position with the Ramapo Wheel & Foundry Company until 1883, when he resigned from the latter company. He assisted in organizing the Ramapo Foundry Company, and when the latter was merged with the American Brake Shoe & Foundry Company he became a director, a member of the executive committee and chairman of the finance committee, which position he held until his death. His main activities, however, concerned the Ramapo Ajax Corporation.

Charles Ffolliott, chairman of the board of directors of A. Guthrie & Company, Inc., St. Paul, Minn., died in that city on March 22, at the age of 78 years. Mr. Ffolliott, who was a native of Ireland, had been engaged in railway construction work for 49 years. He was employed by the contractor on the construction of a section of the Canadian Pacific and later he joined a contractor who was engaged in the construction of the Great Northern west from Minot, N. D. With Archibald Guthrie, Mr. Ffolliott formed A. Guthrie & Co. in 1896, and for the following 17 years, he assumed personal charge of all operations of the company, a period during which it constructed 2,500 miles of railroad for the Great Northern, the Northern Pacific and the Chicago, Burlington & Quincy. He served as president of the company from 1913 to 1923, and had been chairman of the board since 1923.

Personal Mention

General

W. Claus, engineer maintenance of way of the Cumberland & Pennsylvania, with headquarters at Cumberland, Md., has been promoted to general manager, with the same headquarters.

H. J. McCall, trainmaster-roadmaster on the Dakota division of the Northern Pacific, with headquarters at Mandan, N. D., has been appointed trainmaster on the Pasco division, with headquarters at Pasco, Wash., to succeed **W. W. Judson,** transferred.

Thomas Scott, formerly a general roadmaster on the Union Pacific, whose promotion to superintendent of the Victoria division of the Southern Pacific was noted in the April issue, has served that road for 14 years. Mr. Scott's first railway service was with the Southern Pacific in 1892, when he was a general foreman on the construction of the Dallas-Sabine lines in Texas. In 1894, he became connected with the construction forces of the Wisconsin Central (now part of the Minneapolis, St. Paul & Sault Ste. Marie), later leaving this company to go with the Union Pacific, where he was appointed roadmaster at Lincoln, Neb., in 1906, being transferred later to Kearney, Neb. In 1911, Mr. Scott was promoted to assistant superintendent at Omaha, Neb., and three years later he was further promoted to general roadmaster, with the same headquarters. In 1918 he was appointed assistant superintendent on the Beaumont-Galveston division of the Texas and Louisiana lines of the Southern Pacific, with headquarters at Houston, Tex., being then transferred to the Dallas-Sabine district, with headquarters at Jacksonville, Tex., in 1920. During 1926, and part of 1927, he supervised construction work on the Valley line south from Fulfurrias, Tex., returning to Houston on May 1 of the latter year as assistant superintendent. On January 16, 1928, he was transferred to the Dallas division at Ennis, Tex., where he remained until his promotion to superintendent of the Victoria division on March 1.

J. A. Rogers, formerly a division engineer on the Canadian National, and for the last few years assistant superintendent on that road, with headquarters at Saskatoon, Sask., has been promoted to superintendent with headquarters at Prince Albert, Sask. Mr. Rogers was born at Cayuga, Ont., on July 19, 1883, and, from the time he entered railway service on October 1, 1905, until December 31, 1909, he held the positions of topographer, transitman, leveller, instrumentman and resident engineer, respectively, on the National Transcontinental (now part of the Canadian National). On the latter date he resigned to become connected with Mackenzie, Mann & Company, but in April, 1911, he accepted a position as resident engineer on the Canadian Northern (now a part of the Canadian National) at Edmonton, Alta., in connection with the construction of that road. On June 1, 1916, he entered the engineering department of the Canadian National as division engineer at Saskatoon, and held this position until May 1, 1926, except for a period in 1918, when he was in military service. From September 25, 1925, until May 1, 1926, Mr. Rogers held the position of acting assistant superintendent at Saskatoon as well as division engineer, and on October 1, 1926 he was made assistant superintendent, the position which he was holding at the time of his recent promotion to superintendent.

S. W. Fairweather, who has been engaged in railway engineering work in Canada for a number of years, has been appointed director, Bureau of Economics, of the Canadian National. Mr. Fairweather was born in the Maritime Provinces, and after completing his engineering education at McGill University, he became an assistant engineer with the Department of Railways and Canals in 1916. From April, 1917, until the following year he was an assistant engineer on the construc-

S. W. Fairweather

tion of the Quebec bridge, and later became structural engineer and office engineer of the Department of Railways and Canals at Ottawa, Que. In April, 1923, Mr. Fairweather joined the Department of Economics of the Canadian National, and in 1929 he was appointed assistant director of that department, the position which he has held until his recent promotion.

Engineering

A. W. Gardner, assistant engineer on the Fitchburg division of the Boston & Maine, with headquarters at Greenfield, Mass., has resigned.

C. L. Crummett has been appointed assistant cost engineer on the Chesapeake & Ohio, with headquarters at

Richmond, Va., to succeed **H. S. Talman**, who has been promoted.

W. Fields, office engineer on the International-Great Northern, with headquarters at Houston, Tex., has been promoted to division engineer, with headquarters at San Antonio, Tex.

J. S. Gillum, supervisor of track on the Pennsylvania, with headquarters at Lancaster, Pa., has been appointed assistant division engineer of the Philadelphia Terminal division, with headquarters at West Philadelphia, Pa.

R. R. Tiley has been appointed engineer maintenance of way of the Cumberland & Pennsylvania, with headquarters at Cumberland, Md., to succeed **W. Claus**, whose promotion to general manager is noted elsewhere in these columns.

E. J. Robrecht, bridge inspector in the chief engineer's office of the Central Railroad of New Jersey, with headquarters at Jersey City, N. J., has been promoted to assistant engineer in the division engineer's office, with the same headquarters.

R. B. Fetters, assistant engineer on the Chicago, Rock Island & Pacific, with headquarters at Herington, Kans., has been promoted to resident engineer on the construction of Section 5 of the joint line of this road and the Chicago, Milwaukee, St. Paul & Pacific between Polo, Mo., and Birmingham, with headquarters at Lawson, Mo. **Charles U. Kitzmiller** has been appointed assistant engineer at Herington to succeed Mr. Fetters.

A. H. Woerner, division engineer on the St. Louis division of the Baltimore & Ohio, with headquarters at Washington, Ind., has been transferred to Garrett, Ind., to succeed **F. D. Batchellor**, who has been transferred to the Newark division, with headquarters at Newark, Ohio, where he succeeds **R. W. Gabriel**, who has been transferred to Washington to replace Mr. Woerner.

W. C. Frehse, formerly valuation engineer of the Duluth, Winnipeg & Pacific (now part of the Canadian National) and also with the engineering staff of the Minneapolis, St. Paul & Sault Ste. Marie, has been appointed by the Colombia government as Jefe de Comision de Trazados (chief of location) of the Ferrocarril de Carare, with headquarters at Tunja, Boyaca, Colombia, S. A. For the past four years Mr. Frehse has been engaged on construction work in Colombia with the Winston Brothers Company and the P. Lyall & Sons Construction Company.

Ralph F. Macaulay, track supervisor on the Terminal division of the Boston & Maine, with headquarters at Salem, Mass., has been promoted to assistant engineer, with headquarters at Boston, Mass., succeeding **Francis T. Flynn**, who has been promoted to assistant division engineer, with headquarters at Brattleboro, Vt. **A. I. Gauthier**, bridge and building supervisor, with headquarters at Concord, N. H., has been appointed assistant division engineer, with the same headquarters. **H. A. Wickens**, transitman on the Fitchburg division, with headquarters at Greenfield, Mass., has been promoted to assistant engineer, with headquarters at Fitchburg, Mass., and **G. A. Haskins**, resident engineer, with headquarters at Greenfield, has been promoted to assistant engineer, with headquarters at North Adams, Mass. **E. B. Tourtellotte**, assistant supervisor of bridges and buildings, with headquarters at Greenfield, has been promoted to assistant engineer, with the same headquarters.

A. Lee Atwill, whose promotion to valuation engineer of the Chicago & Western Indiana, was noted in the April issue, was born on December 28, 1885, at Hickman, Ky., and was educated at the State University of Kentucky. He began his railway career on September 15, 1912, as a draftsman on the Illinois Central, but in March, 1913, he left this road to become a rodman in the engineering department of the Chicago & Western Indiana, being promoted to levelman on October 1, 1913, and to transitman on August 1, 1915. After serving in the latter capacity for seven months, he was made an instrumentman and on December 15, 1916, he was promoted to assistant engineer. From 1918 to 1925, Mr. Atwill was assigned principally to duties in connection with the federal valuation of the properties of the C. & W. I. and the Belt Railway of Chicago. From

A. Lee Atwill

1925 to 1930 his duties consisted mainly of work in connection with track elevation at South Chicago, Ill., Kensington and Burnside. His promotion to valuation engineer, with headquarters at Chicago, became effective on March 1, 1930. Mr. Atwill's jurisdiction extends over the Belt Railway of Chicago.

A. B. Clark, superintendent of the Trenton division of the Pennsylvania, with headquarters at Trenton, N. J., has been appointed assistant to the chief engineer, with headquarters at Philadelphia, Pa., coincident with the abolition of the Trenton division, which has been divided between the Camden Terminal and the New York divisions. Mr. Clark was born on October 1, 1867, at Green Village, Pa., and was educated at Mercersburg College and at Lafayette College, graduating from the latter in 1891. He entered railway service with the Pennsylvania on July 1, 1889, as a rodman on the Middle division, with headquarters at Harrisburg, Pa., and has been

A. B. Clark

with that company continuously. On September 14, 1891, he was transferred to the Philadelphia division and on November 1, 1895, he was promoted to assistant engineer in the office of the principal assistant engineer at Altoona, Pa. On July 2, 1896, he was promoted to assistant supervisor and served in this capacity on the Altoona and the Pittsburgh divisions until July 1, 1900. On that date he was promoted to supervisor, in which position he served on the Baltimore and the Pittsburgh divisions until December 15, 1901, when he was appointed division engineer. He served in this capacity on various divisions, including the Renovo and the Maryland divisions, until January 14, 1910, when he was appointed principal assistant engineer of the Philadelphia, Baltimore & Washington (part of the Pennsylvania), with headquarters at Wilmington, Del. On June 6, 1913, Mr. Clark was appointed assistant engineer maintenance of way at Philadelphia, being on September 28, 1916, promoted to superintendent of the Renovo division, with headquarters at Erie, Pa. On August 20, 1917, he was transferred to the Philadelphia Terminal division, with headquarters at Philadelphia, Pa., and on May 26, 1918, he was further transferred to the Trenton division, where he was located at the time of his recent appointment, which became effective on April 16.

H. L. Friend, instrumentman in the construction department of the Missouri Pacific, with headquarters at St. Louis, Mo., has been promoted to assistant division engineer on the Gulf Coast Lines of that road, with headquarters at De Quincy, La., to succeed **W. M. Aldrich**, who has resigned to

become a draftsman on the Chicago & Western Indiana, with headquarters at Chicago. Mr. Friend was born on August 14, 1896, at St. Elmo, Ill., and graduated from the University of Arkansas in 1925, with a degree in civil engineering. He was employed on the M. P. on June 22, 1925, as a rodman at Wynne, Ark., and in less than a month he was promoted to instrumentman, with the same headquarters. On September 15, 1926, he was transferred to the construction department, with headquarters at St. Louis, Mo., where he served as instrumentman and draftsman on location until his promotion to assistant division engineer, effective March 23.

H. B. Dick, assistant valuation engineer of the Baltimore & Ohio, with headquarters at Baltimore, Md., who was retired on February 1, 1930, was born on January 8, 1861, at Hopewell, Ohio. From the time he entered railway service in 1883, until 1902, he held the positions of chainman, rodman, levelman, transitman, draftsman, resident engineer and engineer maintenance of way on the Zanesville & Ohio River and the Ohio & Little Kanawha, successor to the Z. & O. R., except for short periods when he was connected with the Cleveland, Akron & Columbus, the Shawnee & Muskingum River and the Zanesville Belt Line. On February 1, 1902, he was appointed assistant division engineer on the B. & O. and on May 1 of the same year he was promoted to division engineer. On May 1, 1910, he was promoted to engineer maintenance of way of the Baltimore & Ohio Southwestern (part of the B. & O.) and on June 5, 1912, he was transferred to the Cincinnati, Hamilton & Dayton. On July 1, 1913, he returned to the B. & O. S. W. as district engineer maintenance of way and on December 13, 1914, he was made pilot engineer in charge of valuation on the C. H. & D. On June 1, 1916, he was promoted to district valuation engineer on the B. & O. S. W. and the C. H. & D. and on January 3, 1918, he was appointed acting valuation engineer of the B. & O. On August 18, 1919, he was made assistant valuation engineer of this road.

C. O. Long, assistant division engineer on the Pennsylvania, with headquarters at Ft. Wayne, Ind., has been promoted to division engineer at Indianapolis, Ind., succeeding **G. H. Schlotterer,** who has been transferred to Toledo, Ohio. Mr. Schlotterer replaces **H. W. Brown,** who has been transferred to the office of the chief engineer maintenance of way, of the Western region, with headquarters at Chicago. **F. G. Church,** supervisor of track on the Central region, with headquarters at Wooster, Ohio, has been promoted to assistant division engineer at Ft. Wayne, to succeed Mr. Long.

Mr. Long has served in the engineering and maintenance of way departments of the Pennsylvania for almost 23 years except for a period of more than a year when he was engaged in the operating department as assistant freight trainmaster. He was born on September 1, 1887, at Renovo, Pa., and was graduated from Bucknell University in 1909. Before leaving college he served as chainman in the engineering department of the Allegheny division of the Pennsylvania and as a trackman on the same division. On October 4, 1909, Mr. Long entered the service of the Pennsylvania permanently as a rodman in the office of the engineer maintenance of way, with headquarters at Philadelphia, Pa. He was promoted to transitman with headquarters at Philadelphia on July 1, 1914, and 10 months later he was promoted further to assistant supervisor at Cresson, Pa. On March 1, 1920, Mr. Long was promoted to supervisor at Phillipsburg, N. J., and on November 1, 1923, he was transferred to the operating department as an assistant freight trainmaster, with headquarters at Jersey City, N. J. He returned to the position of supervisor at Trenton, N. J., on January 19, 1925, where he remained until March 3, 1929, when he was promoted to assistant division engineer at Fort Wayne. His promotion to division engineer became effective on April 1.

C. O. Long

Track

M. Clarke, roadmaster on the Gulf, Colorado & Santa Fe, with headquarters at Temple, Tex., has been granted a 90-day leave of absence on account of ill health.

S. B. Porter, roadmaster on the Norfolk & Western, with headquarters at Fort Gay, W. Va., is on a leave of absence on account of illness and is being replaced by **B. H. Maben,** assistant roadmaster.

B. H. Goodwin has been promoted to assistant track supervisor on the Atlanta division of the Southern, with headquarters at Cochran, Ga., to succeed **E. H. Oliver,** who has been transferred to Rome, Ga., on the same division, where he replaces **G. H. Echols,** who has been promoted to track supervisor on the Georgia Southern & Florida (part of the Southern), with headquarters at Jacksonville, Fla. Mr. Echols succeeds **H. G. Anderson,** who has resigned.

J. D. Mead, assistant on the engineer corps of the Pennsylvania, has been promoted to assistant supervisor on the Trenton division, with headquarters at Phillipsburg, N. J., to succeed **W. T. Hammond,** who has been transferred to Woodside, L. I.

Adams Smith, supervisor on the Delaware, Lackawanna & Western, with headquarters at Mt. Morris, N. Y., has been promoted to roadmaster, with headquarters at Stroudsburg, Pa., succeeding **Murt Dowling,** whose death is noted elsewhere in these columns. **Boyd Strausser,** supervisor at Stroudsburg, resigned on April 1 to undertake other work.

J. A. Bryan, roadmaster on the Northern Pacific, with headquarters at Missoula, Mont., has been promoted to division roadmaster at Spokane, Wash., succeeding **J. M. Hurley,** who retired from service under the pension rules of the company on April 1. **R. A. Sharood** has been appointed roadmaster on the Yellowstone division, with headquarters at Glendive, Mont., to succeed **A. Kimball,** who has been transferred to the Rocky Mountain division, with headquarters at Missoula, to succeed **Mr. Bryan.**

M. Doyle, supervisor of track on the Illinois Central, with headquarters at Clinton, Ill., whose retirement was noted in the April issue, was born in Ireland in 1862 and came to this country in 1885. He entered railway service immediately with the Illinois Central as a section laborer at Burtonview, Ill., and has remained with this company continuously. In 1889, he was promoted to section foreman at Poplar City, Ill., and in February, 1891, he was transferred to Monticello, Ill. In July, 1914, he was promoted to supervisor at Clinton.

R. E. Mattson, assistant bridge and building supervisor on the Fargo division of the Northern Pacific, has been promoted to roadmaster on the same division, with headquarters at Fargo, N. D., to succeed **P. Berryhill,** who has been transferred to the Rocky Mountain division, with headquarters at Missoula, Mont., where he succeeds **H. Heleen.** Mr. Heleen has been promoted to division roadmaster of the Fargo division, with headquarters at Fargo, N. D., where he replaces **C. W. Coil,** who has been appointed trainmaster-roadmaster on the Dakota division, with headquarters at Mandan, N. D., to succeed **H. J. McCall,** whose appointment as trainmaster is noted elsewhere in these columns.

J. B. Otto, Jr., supervisor on special duty on the Philadelphia Terminal division of the Pennsylvania, with headquarters at West Philadelphia, Pa., has been appointed acting supervisor on the Baltimore division at Parkton, Md., succeeding **H. H. Pevler,** who has been

transferred to Camden, N. J., to succeed **W. S. Reitz,** who has been transferred to Lock Haven, Pa. Mr. Reitz, in turn, relieves **G. A. Williams,** who has been transferred to Chambersburg, Pa., succeeding **B. W. Tyler, Jr.,** who has been transferred to Lancaster, Pa. Mr. Tyler replaces **J. S. Gillum,** whose promotion to assistant division engineer is noted elsewhere in these columns.

J. A. Schwab, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Elmira, N. Y., was noted in the March issue, was born on July 26, 1903, in North Dakota. He received his higher education at the United States Military Academy at West Point, and entered railway service on November 8, 1927, as a rodman in the construction department of the Pennsylvania, working on the new bridge over Newark Bay. On March 15, 1928, he was promoted to chief of the party and assistant to bridge engineer, and on November 10, 1928, he was transferred to the maintenance of way department as an assistant supervisor, with headquarters at Williamsport, Pa. On January 7, 1929, he was transferred to North Philadelphia, Pa., and on January 1, 1930, he was transferred to Perryville, Md., where he was located at the time of his recent promotion to supervisor of track.

W. W. Flanagan has been appointed roadmaster on the Carthage district of the White River division of the Missouri Pacific, with headquarters at Aurora, Mo., to succeed **M. J. Farrell,** who has been granted a leave of absence on account of ill health. Mr. Flanagan was born on January 1, 1880, at Nowata, Okla., and graduated from the public schools of Tahlequah, Okla., later attending college. He entered railway service with the M. P. in 1905, as a track man and in 1906 he was promoted to foreman, serving in this position until 1908, when he left railway service to engage in farming. He returned to the M. P. as a section foreman at Wagoner, Okla., on November 6, 1912, being then transferred on May 1, 1914, to Lenepah, Okla., where he served for a year. On May 1, 1915, he was transferred to Nowata, Okla., and nine months later he was promoted to extra gang foreman, which position he was holding at the time of his recent promotion to roadmaster.

D. A. McNeill, whose promotion to roadmaster on the Canadian National, with headquarters at Stratford, Ont., was noted in the March issue, has been with the C. N. R. for 17 years. He entered railway service on April 1, 1910, as an extra laborer on the Grand Trunk (now part of the Canadian National), with headquarters at Allenford, Ont., and on September 1, 1910, he went to Shallow Lake, Ont., as a trackman. In 1912 he left the service of this road to engage in other work, but on May 1, 1915, he returned to Allenford, where he remained as a trackman until January, 1916, when he was transferred to Palmerston. In July, 1916, he was transferred to Fergus, Ont., and two months later he was promoted to section foreman, with headquarters at Southhampton, Ont. In the spring of 1918, Mr. McNeill was promoted to extra gang foreman, with headquarters at Palmerston, and from that time until his recent promotion to roadmaster he served as extra gang foreman during the summer and as track foreman at Palmerston during the winter.

B. J. Casey, general foreman on the Terminal division of the Boston & Maine, with headquarters at Boston, Mass., has been promoted to assistant track supervisor, with the same headquarters, succeeding **Patrick O'Donnell,** who has been promoted to supervisor, with headquarters at Salem, Mass. Mr. O'Donnell succeeds **Ralph F. Macaulay,** whose promotion to assistant engineer is noted elsewhere in these columns. **A. C. Benson,** transitman on the Southern division, with headquarters at Concord, N. H., has been promoted to assistant track supervisor, with headquarters at Lowell, Mass., succeeding **L. V. Barrett,** who has been promoted to supervisor in charge of the ballast work under way between Westminster, Mass., and Greenfield. **John E. Sullivan,** section foreman on the Connecticut River division, with headquarters at Bondsville, Mass., has been appointed assistant track supervisor, temporarily, with headquarters at Brattleboro, Vt., succeeding **Joseph Paluch,** who has been appointed, temporarily, track supervisor in charge of grade revision work, with the same headquarters.

Bridge and Building

J. C. Nichols, assistant engineer in the office of the chief engineer of the Louisville & Nashville, with headquarters at Louisville, Ky., has been promoted to assistant bridge inspector, a newly created position.

H. L. McClendon, bridge foreman on the Arkansas division of the Missouri Pacific, has been appointed bridge inspector on the White River division to succeed **U. A. Horn,** who is on a leave of absence.

H. L. Forney, master carpenter on the Pittsburgh division of the Baltimore & Ohio, with headquarters at Pittsburgh, Pa., has retired after nearly 38 years of almost continuous service with that road.

J. R. Masterson, assistant supervisor of bridges and buildings on the Louisville & Nashville, with headquarters at La Grange, Ky., has been promoted to supervisor of bridges and buildings, with the same headquarters, to succeed **H. M. Brooks,** who has been promoted to bridge inspector, with headquarters at Louisville, to replace **A. H. Snellen,** retired.

Ernest M. Stromvall, transitman on the Terminal division of the Boston & Maine, with headquarters at Boston, Mass., has been promoted to assistant supervisor of bridges and buildings, with the same headquarters, succeeding **John W. Gannon,** who has been promoted to supervisor of bridges and buildings, with headquarters at Concord, N. H., to succeed **A. I. Gauthier,** whose promotion to assistant division engineer is noted elsewhere in these columns.

J. A. Youngblood, whose promotion to supervisor of bridges and buildings on the Mobile and Meridian districts of the Mobile & Ohio, with headquarters at Meridian, Miss., was noted in the March issue, was born at Noxupater, Miss., on November 20, 1883. He graduated from high school in 1900 and joined the bridge and building department of the Yazoo & Mississippi Valley (now part of the Illinois Central) on July 13, 1903. He severed his connections with this road on January 1, 1909, and on the same date he became connected with the bridge and building department of the Mobile & Ohio. From the position of bridge carpenter, he was promoted successively through the positions of assistant bridge foreman and bridge foreman, and was holding the latter position at the time of his recent promotion to supervisor of bridges and buildings.

Purchases and Stores

A. E. Owen has been appointed assistant purchasing agent of the Pennsylvania, with headquarters at Philadelphia, Pa., and **George H. Schultz,** assistant fuel purchasing agent at Philadelphia, will succeed him as assistant purchasing agent at Chicago.

M. E. Bailie, district storekeeper on the Missouri Pacific, with headquarters at St. Louis, Mo., has been appointed assistant supply agent, with headquarters at the same point. **Charles Williams** has been appointed district storekeeper at St. Louis, succeeding Mr. Bailie.

Obituary

Murt Dowling, roadmaster on the Delaware, Lackawanna & Western, with headquarters at Stroudsburg, Pa., died at his home at Stroudsburg on April 11.

John McGarvey, formerly a roadmaster on the Buffalo, Rochester & Pittsburgh, who retired as superintendent of the Rochester and Buffalo divisions of that road in 1907, died suddenly on March 4 at Rochester, N. Y.

H. I. Miller, an engineer by training and early experience, and later a railroad executive, died at his home in New York on April 22 at the age of 68 years. Mr. Miller graduated from Cornell University and served in the engineering and operating departments of the Pennsylvania for 20 years. He later served in various executive positions with a number of roads in the middle west and at one time he was president of the New Orleans Great Northern.

STATEMENT of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of *Railway Engineering and Maintenance*, published monthly at Chicago, Ill., for April 1, 1930.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared E. A. Simmons, who, having been duly sworn according to law, deposes and says that he is the President of the Publisher of *Railway Engineering and Maintenance*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Simmons-Boardman Publishing Co., 30 Church Street, New York, N. Y.

Editor, Elmer T. Howson, 105 W. Adams St., Chicago, Ill.

Managing Editor, Walter S. Lacher, 105 W. Adams St., Chicago, Ill.

Business Manager, F. C. Koch, 30 Church St., New York, N. Y.

2. That the owners are:

Simmons-Boardman Publishing Co., 30 Church St., New York, N. Y.; Simmons-Boardman Publishing Corporation, 30 Church St., New York, N. Y. Stockholders of 1 per cent or more of the total amount of stock are: E. A. Simmons, 30 Church St., New York, N. Y.; I. R. Simmons, 1625 Ditmas Ave., Brooklyn, N. Y.; P. A. Lee, Hopatcong, N. J.; H. Anderson, 246 Rugby Rd., Brooklyn, N. Y.; E. G. Wright, 398 N. Walnut St., E. Orange, N. J.; S. O. Dunn, 105 W. Adams St., Chicago, Ill.; C. E. Dunn, 3500 Sheridan Road, Chicago, Ill.; B. L. Johnson, 105 W. Adams St., Chicago, Ill.; W. A. Radford, 407 So. Dearborn St., Chicago, Ill.; L. B. Sherman, 375 Sheridan Rd., Winnetka, Ill.; Mae E. Howson, 105 W. Adams St., Chicago, Ill.; Spencer Trask & Company, 25 Broad St., N. Y. Partners of Spencer Trask & Company are: E. M. Bulkley, Acosta Nichols, Cecil Barret, J. Graham Parsons, C. Everett Bacon, William H. Basset, F. Malbone Blodget, Percival Gilbert, Harry S. Allen, Harry A. Minton, William Beckers, W. V. C. Ruxton, all of 25 Broad St., New York, N. Y.; Arthur H. Gilbert, 308 La-Salle St., Chicago, Ill.; S. Wallace Roe, 253 State St., Albany, N. Y.; William E. Stanwood, 50 Congress St., Boston, Mass.; John Nightingale, 50 Congress St., Boston, Mass.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

E. A. SIMMONS.

Sworn to and subscribed before me this 31st day of March, 1930.

[SEAL] H. D. NELSON.

(My commission expires March 31, 1931.)

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CLASSIFIED INDEX TO ADVERTISERS

CLASSIFIED INDEX TO ADVERTISERS—(Continued)

Locomotives, Oil Engine Electric Driven
Ingersoll-Rand Co.

Manganese Track Work
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Manholes
Massey Concrete Products Corp.

Markers
Massey Concrete Products Corp.
Premax Products, Inc.

Mile Posts
Massey Concrete Products Corp.

Motor Bearings
Timken Roller Bearing Co.

Motors and Generators
Fairbanks, Morse & Co.

Mowing Machines
Fairmont Railway Motors, Inc.

Number Plates
Premax Products, Inc.

Non-Derailer
Ramapo Ajax Corp.

Nut Locks
Dardalet Threadlock Co.
National Lock Washer Co.
Reliance Manufacturing Co.
Verona Tool Works
Woodings Forge & Tool Co.

Nuts
Bethlehem Steel Co.
Dardalet Threadlock Co.
Illinois Steel Co.

Oil, Snow Melting
Cook Co., Howard F.

Out Houses
Massey Concrete Products Corp.

Oxy-Acetylene Welding Equipment
Oxweld Railroad Service Co.

Oxygen
Oxweld Railroad Service Co.

Paint
National Lead Co.
U. S. Graphite Co.

Paint, Graphite
U. S. Graphite Co.

Paint, Metal Protecting
Barber Asphalt Co.
National Lead Co.
U. S. Graphite Co.

Pavement Breakers
Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Penstocks
Fairbanks, Morse & Co.
Naylor Pipe Co.

Pile Drivers
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
Ingersoll-Rand Co.

Piling
Carnegie Steel Co.
Jennison-Wright Co.
Massey Concrete Products Corp.
Southern Wood Preserving Co.

Pipe Carriers
Massey Concrete Products Corp.

Pipe, Cast Iron
Central Foundry Co.
U. S. Cast Iron Pipe & Foundry Co.
Massey Concrete Products Corp.

Pipe, Corrugated
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Pipe, Iron Alloy
Naylor Pipe Co.

Pipe, Sewer
Armco Culvert Mfrs. Assn.
Central Foundry Co.
Massey Concrete Products Corp.
Naylor Pipe Co.
Toncan Culvert Mfrs. Assn.

Pipe, Spiral Weld
Naylor Pipe Co.

Pipe, Steel
Naylor Pipe Co.

Plants, Water Treating
Chicago Bridge & Iron Works
Graver Corp.

Plates, Miscellaneous
Ramapo Ajax Corp.

Plumbing Fixtures, Brass
Standard Sanitary Mfg. Co.

Plumbing Fixtures, Enameled
Standard Sanitary Mfg. Co.

Plumbing Fixtures, Vitreous China
Standard Sanitary Mfg. Co.

Poles
Jennison-Wright Co.
Massey Concrete Products Corp.
Southern Wood Preserving Co.

Post Hole Diggers
Buda Co.

Power Jack
Nordberg Mfg. Co.

Power Plants, Portable
Northwestern Motor Co.
Syntron Co.

Preservation, Timber
Jennison-Wright Co.
Southern Wood Preserving Co.

Products, Gas
Oxweld Railroad Service Co.

Pumps, Air Pressure & Vacuum, Centrifugal, Deep Well, Piston Plunger, Rotary, Slump
Chicago Pneumatic Tool Co.
Fairbanks, Morse & Co.
Gardner-Denver Co.
Ingersoll-Rand Co.
Layne & Bowler, Inc.
Sullivan Machinery Co.

Push Cars
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.

Push Car Bearings
Timken Roller Bearing Co.

Rail Anchors
American Fork & Hoe Co.
Bethlehem Steel Co.
Coover Railroad Track Brace Co.
Lundie Engineering Corp.
P. & M. Co.
Verona Tool Works
Woodings Forge & Tool Co.

Rail Benders
American Chain Co., Inc.
Buda Co.
O. & C. Co.
Verona Tool Works

Rail Bonds
American Steel & Wire Co.
Verona Tool Works

Rail Braces
Bethlehem Steel Co.
Buda Co.
Coover Railroad Track Brace Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton Jr., & Co., Wm.

Rail Expanders
Ramapo Ajax Corp.

Rail Layers
Buckeye Traction Ditcher Co.
Cullen-Friestedt Co.
Maintenance Equipment Co.
Nordberg Mfg. Co.

Rail Saws, Portable
Industrial Brownhoist Corp.
Kalamazoo Railway Supply Co.

Rail Shims
American Fork & Hoe Co.

Rail Springs
Verona Tool Works

Rails, Girder
Bethlehem Steel Co.

Rails, Reconditioning
Morrison Railway Supply Corp.

Rails, Tee
Bethlehem Steel Co.
Carnegie Steel Co.

Regulators, Oxy-Acetylene
Oxweld Railroad Service Co.

Replacers, Car & Locomotive
American Chain Co., Inc.
Buda Co.

Retaining Walls, Precast
Federal Cement Tile Co.
Massey Concrete Products Corp.

Rivets
Bethlehem Steel Co.

Rock Hammers
Gardner-Denver Co.
Ingersoll-Rand Company

Rods, Welding
Oxweld Railroad Service Co.

Roof Slabs
Federal Cement Tile Co.
Massey Concrete Products Corp.

Roofing, Cement & Concrete Tile
Federal Cement Tile Co.

Roofing Composition
Barber Asphalt Co.

Rules
Lufkin Rule Co.

Rust Preventive
Dearborn Chemical Co.

Saw Rigs
American Saw Mill Machinery Co.
Fairbanks, Morse & Co.

Saws, Electric
Reed-Prentice Corp.

Saws, High Speed Friction
American Saw Mill Machinery Co.

Saw Mills
American Saw Mill Machinery Co.

Saws, Portable, Rail
Q. & C. Co.

Saws, Timber
Reed-Prentice Corp.

Scales, Tape
Lufkin Rule Co.

Scales, Track
Fairbanks, Morse & Co.

Screw Spikes
Illinois Steel Company

Screw Spike Drivers
Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.

Sharpeners, Rock Drill Steel
Gardner-Denver Co.
Ingersoll-Rand Co.

Sheathing Paper
Barber Asphalt Co.

Sheet Iron
Armco Culvert Mfrs. Assn.

Shingles, Composition
Barber Asphalt Co.

Shovels
Verona Tool Works
Woodings Forge & Tool Co.

Signals, Bridge & Warning
Hastings Signal & Equipment Co.

Siphons
Armco Culvert Mfrs. Assn.

Skid Excavators & Dredges
Northwest Engineering Co.

Skid Shoes
Q. & C. Co.

Slabs, Concrete
Massey Concrete Products Corp.

Smokestacks
Chicago Bridge & Iron Works
Massey Concrete Products Corp.

Snow Melting Device
Cook Co., Howard F.
Lundie Engineering Corp.
Q. & C. Co.
Ruby Railway Equipment Co.

Snow Plows
Jordan Co., O. F.
Q. & C. Co.

Spike Pullers
Independent Pneumatic Tool Co.

Spikes
Bethlehem Steel Co.
Illinois Steel Co.

Standpipes
Chicago Bridge & Iron Works
Fairbanks, Morse & Co.

Stands, Switch & Target
Bethlehem Steel Co.
Ramapo Ajax Corp.
Q. & C. Co.

Steam Enclosures
Toncan Culvert Mfrs. Assn.

Steam Shovels
Bucyrus-Erie Co.
Harnischfeger Corp.
Northwest Engineering Co.
Orton Crane & Shovel Co.

Steel, Alloy
Central Alloy Steel Corp.
Illinois Steel Company

Steel Cross Ties
Carnegie Steel Co.

Steel, Electric Furnace
Timken Roller Bearing Co.

Steel Frame Houses
Butler Mfg. Co.

Steel, Open Hearth
Carnegie Steel Co.
Timken Roller Bearing Co.

Steel Plates and Shapes
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Steel, Special Analysis
Timken Roller Bearing Co.

Storage Tanks
Chicago Bridge & Iron Works
Graver Corp.
Pittsburgh-Des Moines Steel Co.

Storm Sewers, Corrugated Iron
Armco Culvert Mfrs. Assn.

Stream Enclosures, Corrugated Iron
Armco Culvert Mfrs. Assn.

Street Culverts, Part Circle
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Structural Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Switch Guard
Ramapo Ajax Corp.

Switchmen's Houses
Massey Concrete Products Corp.

Switches
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Switchpoint Protectors
Maintenance Equipment Co.

Switchpoint, Reconditioning
Morrison Railway Supply Corp.

Switchstands & Fixtures
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Tampers, Tie
See Tie Tampers

Tanks & Fixtures
Fairbanks, Morse & Co.

Tanks, Fire Protection
Chicago Bridge & Iron Works

Tanks, Oil Storage
Chicago Bridge & Iron Works
Graver Corp.

Tanks, Roadside Delivery
Chicago Bridge & Iron Works

Tanks, Steel
Chicago Bridge & Iron Works
Graver Corp.
Pittsburgh-Des Moines Steel Co.

Tapes, Measuring
Lufkin Rule Co.

Telegraph Service, Long Distance
American Telephone & Telegraph Co.

Telephone Service, Long Distance
American Telephone & Telegraph Co.

Telltales
Hastings Signal & Equipment Co.

Testing of Materials
Hunt Co., Robert W.

Thawing Outfits
Cook Co., Howard F.
Lundie Engineering Corp.
Q. & C. Co.
Ruby Railway Equipment Co.

Ties
Jennison-Wright Co.
Southern Wood Preserving Co.

Tie Plate Clamps
Q. & C. Co.

Tie Plates
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Illinois Steel Co.
Lundie Engineering Corp.

Tie Rods
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Coover Railroad Track Brace Co.

Tie Scorer
Woolery Machine Co.

Tie Spacers
American Chain Co., Inc.
Maintenance Equipment Co.

Tie Tampers
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Gardner-Denver Co.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.
Syntron Co.

Tile, Roofing
Federal Cement Tile Co.

Timber, Creosoted
Jennison-Wright Co.
Southern Wood Preserving Co.

Tools, Oxy-Acetylene Cutting & Welding
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Tools, Pneumatic
Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.

Tools, Track
Buda Co.
Maintenance Equipment Co.
Q. & C. Co.
Verona Tool Works
Woodings Forge & Tool Co.

Tongue Switches
Bethlehem Steel Co.
Buda Co.
Ramapo Ajax Corp.
Wharton Jr. Co., Wm.

Torches, Oxy-Acetylene Cutting & Welding
Oxweld Railroad Service Co.

Track Bolt Wrench
Independent Pneumatic Tool Co.

Track Cranes
Buckeye Traction Ditcher Co.
Cullen-Friestedt Co.
Nordberg Mfg. Co.

Track Gages
Buda Co.
Kalamazoo Railway Supply Co.
Verona Tool Works

Track Insulation
Q. & C. Co.

Track Levels
Kalamazoo Railway Supply Co.

Track, Special Work
Ramapo Ajax Corp.
Wharton, Jr., & Co., Wm.

Trestle Slabs
Massey Concrete Products Corp.

Trench Excavators, Pipe Line, Chain-and-Bucket Type, Wheel Type
Buckeye Traction Ditcher Co.

Trucks, Hand Steel
Anchor Post Fence Co.

Tubing, Seamless Steel
Timken Roller Bearing Co.

Tunnel Warnings
Hastings Signal & Equipment Co.

Undercrossings, Corrugated Iron
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Ventilators
Q. & C. Co.

Warning Devices, Bridge & Tunnel
Hastings Signal & Equipment Co.

Water Columns
Fairbanks, Morse & Co.

Water Cranes
Fairbanks, Morse & Co.

Water Softening Plants
Graver Corp.

Water Supply Contractors
Layne & Bowler, Inc.

Water Tanks
Chicago Bridge & Iron Works
Graver Corp.
Pittsburgh-Des Moines Steel Co.

Water Treating Tanks
Chicago Bridge & Iron Works
Pittsburgh-Des Moines Steel Co.

Waterproofing Fabrics
Barber Asphalt Co.

Weed Burner
Fairmont Railway Motors, Inc.
Woolery Machine Co.

Weed Killer
Chipman Chemical Engineering Co., Inc.
Q. & C. Co.

Welding & Cutting Equipment
Oxweld Railroad Service Co.

Welding, Electric
Electric Railroad Sales Corp.

Welding, Oxy-Acetylene
Oxweld Railroad Service Co.

Well Casings
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Well Systems
Layne & Bowler, Inc.

Wheels, Hand & Motor Car
Buda Co.
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.
Woolery Machine Co.

Wheels, Wrought Steel
Carnegie Steel Co.

Windshields
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.

Wire Fencing
American Steel & Wire Co.
Anchor Post Fence Co.
Page Fence Association

Wood Preservation
See Preservation, Timber

Wood Working Machinery
American Saw Mill Machinery Co.

"RESCO" Cast Steel Guard Rail Clamps

will not stretch, bend or break!

Other Reading Specialties:

ACCO Drop-Forged Guard Rail Clamps;
ACCO One-Piece Guard Rails;
Samson Rail Benders;
Reversible Rail Benders;
ACCO "Triple A" Rail Benders;
Compromise Joints

"Resco" Guard Rail Clamps are high-grade electric cast steel, properly heat-treated. The I-beam section is amply strengthened to prevent stretching or breaking under most severe stresses. Furthermore, "Resco" Guard Rail Clamps can be applied without disturbing the guard rail.

READING SPECIALTIES

AMERICAN CHAIN COMPANY, *Inc.*, BRIDGEPORT, CONN.

World's Largest Manufacturers of Welded and Weldless Chains for All Purposes

In Canada: **Dominion Chain Company, *Limited*, Niagara Falls, Ontario**

Brake chains; Train chains; Sling chains; Switch chains; Gate chains; Wrecking chains; Crane chains; End Door chains; Door Operating chains; Brake Beam chains; Brake Beam Safety chains; etc.

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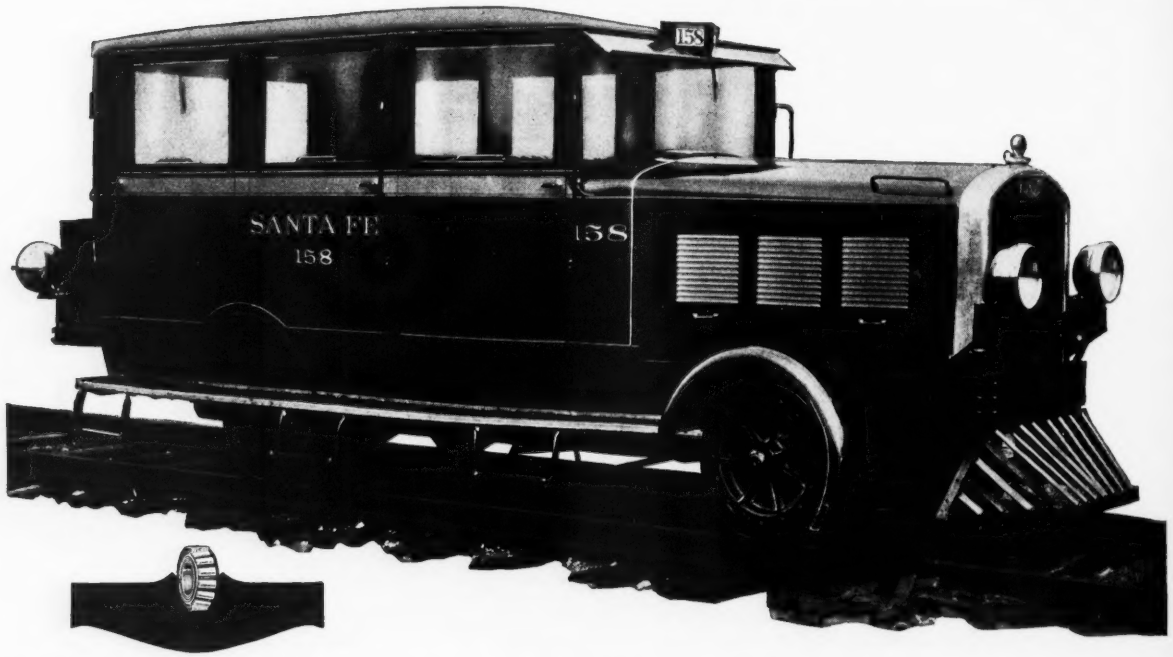

New Inspection Car For Santa Fe Buda Built–Timken Equipped

This automobile-type car, built by the Buda Company, Harvey, Illinois, for the Santa Fe Road, forecasts a new trend in railroad inspection cars.

Special attention has been paid to the design of the running gear in order to secure maximum riding comfort, operating economy and dependability.

Naturally the wheels are equipped with Timken Bearings.

Three of these cars have already been delivered. Car No. 158 was driven under its own power from Harvey, Illinois, to LaJunta, Colorado, over the Raton Mountain. To quote from the manufacturer's report,—

"There is a continuous grade on this mountain running as high as 3% for the first 20 miles, with 11 curves ranging from 3 to 11 degrees. There is a speed limit of 30 miles per hour on this grade and Car No. 158 was able to maintain this speed limit up the entire mountain without difficulty."

And the exclusive combination of Timken tapered construction ... Timken *POSITIVELY ALIGNED ROLLS* ... and Timken steel, will help to preserve this splendid performance-ability permanently by eliminating friction, and affording ample protection against radial, thrust and combined loads under all conditions.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

TIMKEN *Tapered Roller* **BEARINGS**